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The Chemical Age

A Weekly Journal Devoted to Industrial & Engineering Chemistry

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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Other communications relating to advertisements or general matters should be addressed to the Manager.

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Enlargement of "The Chemical Age"

WITH this issue THE CHEMICAL AGE undergoes another enlargement, necessitated by the continued growth of our advertisement pages and our desire to maintain an adequate service of special articles and news. We are obliged to our readers for so many interesting suggestions respecting new features, some of which we hope gradually to introduce as opportunity arises; and it is again a pleasant duty to acknowledge the unfailing appreciation and active assistance which have enabled THE CHEMICAL AGE to make such gratifying progress during the first year of its existence.

U.S. Nitrogen Fixation Plants

THE report, published in this issue, of the U.S. Department of the Interior on the processes and plants for the fixation of nitrogen and the oxidation of ammonia is of great interest, not only because it happens to follow the report of the British Nitrogen Products Committee, but because it is issued at a time when the future of the Muscle Shoals plants is being eagerly discussed in America. Events over there are moving forward rather rapidly. A little while ago particulars were made public of a large hydro-electric development scheme involving the construction of a large power plant and of three dams over the River Tennessee. This work, which was authorised during the war but discontinued for various reasons, has now been handed over to the Army Engineers Corps. As to the necessity for the work itself there appears to be little doubt. The dams and power plant are essential to the operation of the Muscle Shoals nitrate plants, and since the United States seems committed to the nitrogen industry on a national scale it follows that these plans must be carried out.

A new complication, however, has now been introduced by the problem of who is to take charge of them. If nitrogen production is to be made a Government industry, there is, first of all, the troublesome domestic problem of deciding on the right department—whether, for example, it should be the War Department, on account of the close connection between nitrates and munitions; or the Department of Agriculture, on account of the importance of nitrogen as a fertiliser; or the Department of the Interior. These problems are now overshadowed by a new proposal to hand the whole business over to a United States Fixed Nitrogen Corporation, all the stock of which should belong to the United States, but which would conduct the business on ordinary commercial lines instead of within departmental limits. Bills proposing such a corporation have already been introduced in both Houses of Congress, and are supported by an influential group of officials and experts. The general case is well summed up by General Williams, whose proposals are that the United States should vigorously proceed with development and research in the process of nitrogen fixation, that Plant 1 (synthetic ammonia process) should be made effective through such development and research; that Plant 2 (cyanamide process) should be worked for the production of appropriate nitrogen compounds; and that the proposed Wilson dam at Muscle Shoals should be constructed to produce the necessary electrical energy.

The sum required to finance the new corporation is

$12,000,000, which it is proposed to provide by the sale of half of the present reserve stock of Chilean nitrate (300,000 tons) now held by the War Department. All the comments we have seen on the proposal are favourable, but it is not flattering to our national vanity or to the work done in this country to find Great Britain completely ignored as a possible competitor. The only producing nations that the United States seems to take account of are Germany and Chile.

Manchester's Chemical School

THE special campaign to raise half a million sterling for the University of Manchester was opened on Monday, and is being actively prosecuted in the great industrial centres of the district. In the accounts which are now appearing of the work of the University, a prominent place is rightly given to the achievements of the chemistry department. This department goes back to the year 1849, when it was decided to appoint a Professor of Chemistry " to give not only elementary instruction but also a more extended course in chemical science generally." The first professor was Edward Frankland, but after eight years of pioneer work under difficult conditions he retired to accept a post at St. Bartholemew's Hospital. He was succeeded by Henry E. Roscoe, and from the moment of Roscoe's appointment the laboratories grew in reputation throughout the country. The staff was enormously strengthened a few years later by the appointment of Carl Schorlemmer to the chair of organic chemistry—the first to be instituted in this country. The investigations conducted by Roscoe and Schorlemmer raised the chemical department to the front rank in research, and during the years of Roscoe's directorship the laboratories overflowed with students. When he resigned his post in 1885 to enter Parliament Mr. Harold B. Dixon was appointed to the directorship which he still holds. Professor Schorlemmer died in 1892 and was succeeded by Professor W. H. Perkin.

The important additions to the department made in recent years testify to the increasing demands made on its resources and to the growing appreciation of the value of chemical science to industry, while the research work done during the war would make a valuable chapter in itself. Like the other departments of the University, the chemical department is in urgent need of expansion to meet the growing demands on it. In January, 1919, demobilised men began to return in large numbers to their studies. To-day there are about 540 students at work overflowing into the research laboratories, to the inconvenience of themselves and of others engaged specially in research. The pressure in all the scientific departments is described in the University's statement of its needs as " intolerable," and the Chemistry Department, with the others, " must be planned upon a larger scale." Manchester is the centre of an industrial world of its own, and the claims of the University fund are being courageously put before all the great firms of the district. It is to be hoped that in their own interests, no less than in those of the University, they will recognise and generously meet the need.

A Novelty in University Finance

IN connection with this scheme for raising a new endowment fund of half a million for the University of Manchester a bold and highly interesting financial experiment has been decided on. Under the title of " Lancashire Development Unlimited," the University is offering for public subscription shares to the amount of £500,000, divided into 425,000 cumulative participating ordinary bonds of £1 each, and 1,500,000 cumulative participating people's bonds of one shilling each. Subscribers are invited to pay " as much as possible " on application, and the balance on allotment may be spread over three years at the option of the subscriber. The directors—we suppose we must call them that—are the King (as patron of the University), Lord Morley (Chancellor), Sir Henry Miers (Vice-Chancellor), Sir Edward Donner (hon. treasurer) and Mr. H. Derwent Simpson (hon. secretary). The claims of the University are set out in a stirring and picturesque appeal, which describes the issue as " a rare opportunity for a richly paying investment in the unlimited wealth of the human mind." Every citizen of Lancashire is urged " to equip, endow, and enrich the work of the University, which touches life in all its branches." This strikes one as a fine adventure in the democratisation of knowledge, and the definite linking up of learning not only with commercial interests, but with the life of the people at large. The poorer sections of the kingdom have put, perhaps, a fuller trust in the people's belief in higher education than wealthy England has hitherto done. The first university college of Wales, it used to be proudly said, was established by the threepenny bits of the quarrymen, miners and peasants. It is still considered no discredit in Scotland to take a high degree on porridge. If the same wholesome tradition can be introduced in Lancashire and our other industrial areas the life of the people will gain as much as the educational corporations whose work they help to finance.

Commercial Helium

THE discovery that helium could be isolated from natural gas and obtained at a cost of 5d. per cubic foot created a good deal of interest during the war ; and, if lighter-than-air craft come to be extensively employed, America will possess material advantages over other countries, as she is at present the only available source of supply. One of our younger contemporaries, *Industrial Gases*, in an interesting article on the subject, points out that the cost of producing helium from natural gas is considerably less than the cost of extracting it by rectification from the atmosphere. On the other hand, to produce helium at 5d. per cubic foot necessitated the installation of extremely elaborate and expensive plant, and it is very doubtful, in view of the nature of the processes involved and the practical limitations as regards size of units, whether in the present state of our knowledge this cost can be materially reduced. Helium is the lightest gas known, next to hydrogen, of which it has about 92 per cent. of the buoyancy or lifting power. Being at the same time inert and non-inflammable it is obvious that its use as

a substitute for hydrogen in "lighter-than-air" ships would be attended by many advantages, not the least of which would be the practical elimination of all risk of fire. To bring this about it would be necessary to replace practically the whole of the hydrogen with helium owing to the extremely wide range of concentration over which the propagation of flame is possible in a hydrogen-air mixture. At a cost of 5d. per cubic foot this would add about 20 per cent. to the initial cost of the airship.

Apart from its application to flying machines there is at the moment no other use for helium in industry, although our contemporary points out that it might be employed to advantage in the manufacture of electric light bulbs. In view of the fact that America is at present the only available source of supply, all helium required in this country would have to be imported in steel cylinders under high pressure. The standard British Government 400 cubic feet steel cylinders, which are probably more economical than any other type of cylinder so far as concerns the ratio of weight to contents, weigh on the average about seven to the ton. Therefore, in order to inflate with helium a single modern airship of the latest type with a gas-bag capacity of, say, three million cubic feet, a total deadweight in cylinders of 11,000 tons would have to be conveyed twice across the Atlantic; for it must not be overlooked that the cylinders would have to be sent over "empty" to America in the first instance to be filled. The prospects for helium in this country are not, therefore, very promising, and it would seem that, if it becomes essential to commercial aviation, some means will have to be devised for economically tapping the inexhaustible supply contained in the atmosphere.

Mr. Fisher's Apologia

It must be confessed that Mr. Fisher's reply the other day in the House of Commons to Mr. F. D. Acland's questions respecting the recent appointment of a director of research to the Glass Research Association was not particularly convincing. It did little more than present the usual official reasons for non-intervention of behalf of the Government, and the answer contained no hint of the Minister of Education's own opinion, supposing him to have formed one, on the subject. This, after all, was the strictly correct departmental attitude, for, as we pointed out at the time, the appointment, whether good or bad, is made by the Research Association itself and not by the Department of Scientific and Industrial Research. In view of the criticism excited by the appointment, however, the Advisory Council of the Department held an inquiry into the matter, and "after considering all the relevant circumstances with great care recommended the approval of the expenditure involved in this director's appointment." To have withheld financial sanction to the arrangement—practically the only alternative to the course adopted—would have been to treat the Glass Research Association as an incompetent body not capable of managing such affairs. This would have been a severe step and in any case an impolitic one, for no one would desire the whole cause of research and the department responsible for its organisation damaged because of one appointment which in several quarters was thought inadvisable. The incident—and it was never more than an incident—may now be regarded as closed, and the various research associations will be none the worse for the knowledge that their policy is keenly scrutinised in the public interest.

The Calendar

April		
17	Royal Institution of Great Britain: "The Thermionic Vacuum Tube as Detector, Amplifier and Generator of Electrical Oscillations." (First Lecture.) Dr. W. H. Eccles. 3 p.m.	21, Albemarle Street London.
19	Royal Society of Arts: "Aluminium and its Alloys" (Second Lecture), Dr. W. Rosenhain. 8 p.m.	John Street, Adelphi, London.
20	Royal Institution of Great Britain: "Recent Advances in X-ray work" (Second Lecture), 3 p.m.	21, Albemarle Street, London.
20	Sheffield Association of Metallurgists and Metallurgical Chemists: "Elasticity and the Effect of Strain," A. A. Remington.	Sheffield.
20	Royal Institution of Petroleum Technologists: "Methods of Examination of Lubricating Oils," G. F. Robertshaw. 5.30 p.m.	House of the Royal Society of Arts, John Street, Adelphi, W.C. 2.
21	Institute of Chemistry (Irish Section): "Exhibition of Slides illustrating the Manufacture of Cordite," J. W. Parkes, A.I.C. 4.15 p.m.	Royal College of Science, Dublin.
21	Society of Chemical Industry (Newcastle Section): "The Setting of Calcium Sulphate Cements," C. L. Haddon. 7.30 p.m.	Chemical Lecture Theatre, Armstrong College, Newcastle-on-Tyne.
21–22	Society of Glass Technology: Annual Meetings	The Mappin Hall (Applied Science Dept.), The University, St. George's Square, Sheffield.
22	Royal Society. 4.30 p.m.	Burlington House, Piccadilly, London.
22	Royal Institution of Great Britain: (1) "New Experimental Studies in the Liquid State. (2) The Tensile Strength of Liquids," S. Skinner, 3 p.m.	21, Albemarle Street, London.
23	Society of Chemical Industry (Manchester Section): "Distillation Plant with special reference to the Rectification of Alcohol, Acetaldehyde and other Volatile Products and Continuous Ether Manufacturing Plant." S. Masfarand. 7 p.m.	College of Technology, Manchester.
23	Physical Society of London: "The Anomaly of the Nickel-Iron Alloys: Its Causes and its Applications," C. E. Guillaume. 5 p.m.	Imperial College of Science, Imperial Institute Road, South Kensington, S.W.
23	Third Conference of the Chemical Engineering Group: "Labour Saving Devices in Chemical Works."	The University, Birmingham.
24	Royal Institution of Great Britain: "The Thermionic Vacuum Tube as Detector, Amplifier and Generator of Electrical Oscillations" (Second Lecture), Dr. W. H. Eccles. 3 p.m.	21, Albemarle Street, London.

There will be no meeting of the Birmingham Section of the Society of Chemical Industry on April 22, as announced in our last issue, this fixture having been merged with the Chemical Engineering Group Conference on the following day.

Microscopy and Biology in Industry

By F. A. Mason, F.R.M.S.

In the following article some particulars are given of the work carried on in the Bureau of Bio-Technology, Leeds, of which Mr. Mason is the director, together with reasons for the claim that it possesses facilities for investigations of a character not elsewhere adequately provided for.

It may be stated at the outset that the Bureau of Bio-Technology is new only in name. It is true that in recent years the scope of its work has been greatly enlarged, but the laboratories from which it has grown have been in existence for many years. In addition to the ordinary routine chemical and biological control of raw materials and products associated with the fermentation and food industries, researches of a biochemical and biological nature have been in continuous progress, but, as these have been mainly of a private nature, arising in the ordinary course of consulting work, little has been published. Reference may be made, however, to the fact that the results of certain investigations carried out in these laboratories have been published from time to time, some of them more than 20 years ago; they include researches on the Pure Yeast Question,[1] Barley[2] and Malting[3] and are well known in the literature of the industries to which they apply.

Microscopical Laboratory.

In a consulting practice extending over a period of 25 years, we have, throughout, recognised the intimate relationship of biology and chemistry in the technology of many of those branches of industry still referred to as "chemical industries." So far as we are aware, we were for many years the only private firm of technical chemists which, in addition to the usual chemical laboratories, staffed and maintained specially equipped microscopical and biological departments. By so doing we were able to carry through, from beginning to end, investigations which must have been left incomplete in the hands of the analyst or technical chemist working under usual conditions of laboratory equipment and control.

Recent Advances of Technology

In discussing the advances of technology during the last decade it is hardly possible to mention any branch of industry which has not received direct benefit, and in some cases, considerable impetus, from the application of methods of microscopical research. Even in the industries concerned with materials of inorganic origin—*e.g.*, refractory substances, abrasives, building and road-making materials, iron, steel and non-ferrous metal production, paints and pigments, pure chemicals, &c.—the microscope is a valuable aid in the technological examination of the raw and finished products. In the apparently unlikely field of mining and fuel production, the microscope has proved of inestimable value. Its aid has been called in for investigating the causes of colliery explosions, and, although playing a comparatively small part in the investigation, it nevertheless gave information not obtainable in any other way, and which when co-ordinated with other available data, completed a research which led to the adoption of means of safeguarding the lives of thousands of our colliery workers. It is recorded that so far back as 1833, the microscope had begun to be used for the examination of coal, and a recently published monograph on the "Constitution of Coal," published in 1918[4], not only gives a résumé of the microscopical work done since that time but is itself a monument to the importance of the microscope in present-day methods of elucidating a difficult technical problem.

Fortunately, there is every indication that microscopy in its relationship to the requirements of technology is beginning to be viewed in proper perspective. In January of the present year, the Faraday Society together with the Royal Microscopical, Optical, and Photomicrographic Societies, held a symposium on "The Microscope: Its Design, Construction and Application" at Burlington House, and one could not fail to be impressed with the great gathering of eminent technologists representing every branch of industry, as well as with the diversity of apparatus and objects of commercial interest placed on exhibition. The symposium was not only a wonderful demonstration of the wide applicability of the microscope and of the refinements to which microscopy has already attained, but it foreshadowed the further advances and developments of microscopical technique to be expected in the near future.

With regard to the aspects of technology which are purely biological, the microscope performs an even greater service. During the war, chemical products, upon which hung the very life of the nation, have been manufactured in enormous quantities by new processes dependent upon the work of living organisms under conditions of control essentially micro-biological. Such processes were very largely in the hands of chemists, many of whom, in spite of a lack of training in biology, produced results undreamed of in pre-war times, and it is easy to speculate how much greater would have been the chances of developing efficiency and

[1] Murphy, A. J., "Some Aspects on the Pure Yeast Question," *Journ. Inst. Brew.*, V., 1899.

[2] Murphy, A. J., "Some Estimations on 1902 Barleys," *loc. cit.*, IX., 1903.

[3] Murphy, A. J., "The Germination and Kiln Drying of Barley," *loc. cit.*, X., 1904.

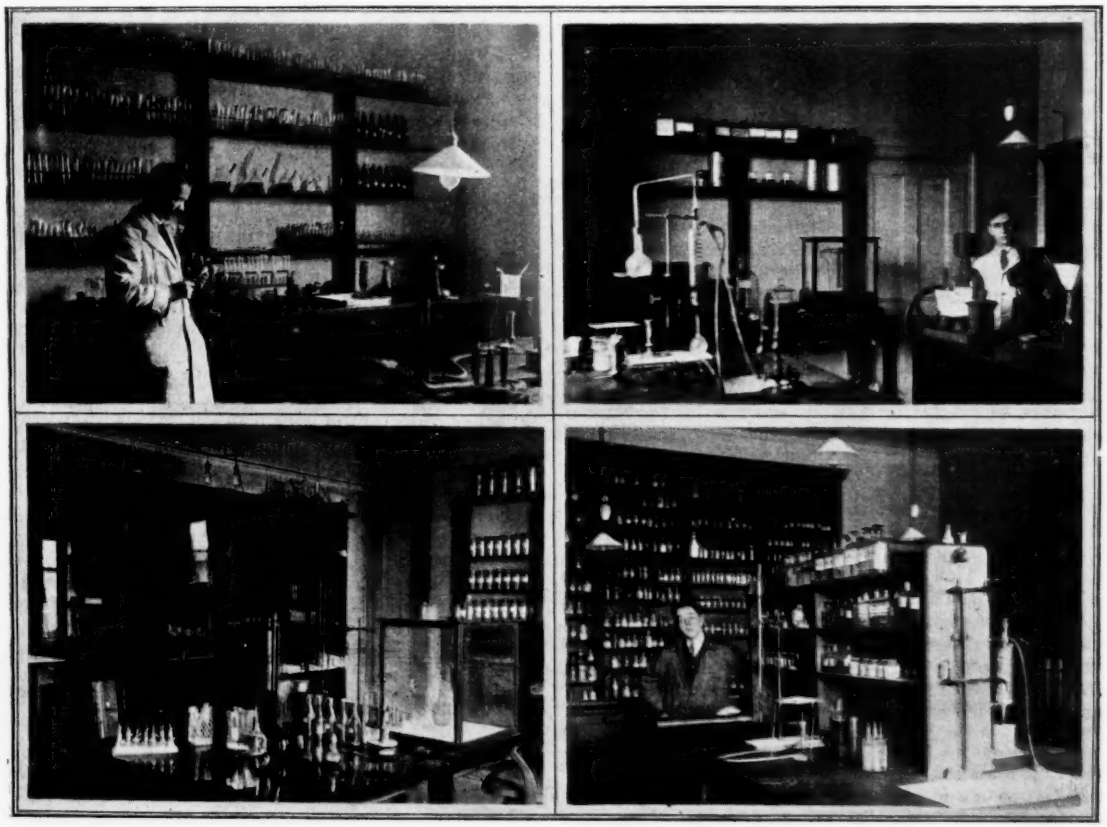
[4] Stopes, Marie, M. and Wheeler, R. V., "Monograph on the Constitution of Coal," *Dept. of Sci. and Ind. Research*, 1918.

economy in these processes if the men in charge had been equipped with a biological training or had possessed ready means of access to all the known facts and literature of biotechnology. It would also have been the means of saving valuable time in isolating and experimenting with various micro-organisms, if such organisms, together with complete data of their biochemistry and biology had been already available.

Relation to Chemical Industries

Many important contributions to the technology of "chemical industries" have been due to the fact that an investigator, usually a chemist, engaged on some everyday problem happened to be familiar with biological methods or was skilled in microscopy. I say "happened" advisedly, because neither of the latter branches of science has been considered to lie within the legitimate scope of the chemist's profession. Men trained in both biology and chemistry are rarely met with in laboratories working under technical and commercial conditions; if so qualified they are usually retained by, or find the most congenial work in, the laboratories of our Universities. In the old days the physicist looked upon chemistry as the dirty part of his subject—a side-line concerned with fireworks and stinks—and, in the same way, the chemist held the biologist in contempt as a philanderer with bugs, moulds, and other small fry, but, as the lines of demarcation between chemistry and physics have disappeared for ever, so surely has the day dawned when chemistry (and therefore physics) and biology in their relationship to science and technology can no longer be separated.

It is not difficult to gather from the signs of the times that the biological aspect of technology is being fully recognised, and the desirability of greater facilities for training and assistance in work of a biological nature duly appreciated. *Nature*, in its issue of August 28, 1919, comments upon a Paper on this important subject read at a conference held under the auspices of the Society of Chemical Industry in August of the same year, in which Mr A. C. Chapman, a leading biotechnologist, proposed the establishment of a national institute for the study of biotechnics[5]. After referring to the inadequate provision in this country for systematic training in industrial microbiology and for the study of the innumerable problems on which it bears, the commentator says: "The first object of such an institute would be to provide for the systematic prosecution of research in connection with any industry in which micro-organisms or enzymes play an important part. Such industries—not to mention brewing and distilling—are, for example, the dairy industry, particularly cheese-making; the bread-making and pressed-yeast industry; tanning; lactic acid making; the treatment of sewage; wine and vinegar making, and agriculture generally. Another function would be the specialised training of teachers of microbiology and biochemistry, and the practical instruction of technical employees. A further object would be the provision of organisms in pure culture for use in industry and the housing of as complete a collection of



(1) Bacteriological Laboratory. (2) Biochemical Laboratory.
(3) Biological Laboratory. (4) Students' Laboratory.

[5] Chapman, A. C., "The Employment of Micro-Organisms in the Service of Industry," *Journ. Soc. Chem. Ind.*, XXXVIII., 1919.

technical micro-organisms as could be got together. No such collection exists in the United Kingdom, scientific and other workers in want of a particular organism are compelled to apply to their friends on the chance that someone may happen to have a specimen, or else must send abroad for it."

What the Bureau is Doing

The Bureau of Bio-Technology is already fulfilling some of the requirements outlined above, not the least useful branch of its activities being that of the collection and maintenance of pure cultures of micro-organisms of industrial importance. Without these cultures as a starting point it is impossible to carry on investigations of the innumerable problems known to be due to enzyme action, our knowledge of the commercial value of which is only on the threshold. Part of such a collection is shown in the photograph of the Bacteriological Laboratory, Fig. 1. Here we are engaged in isolating various species of moulds, yeasts and bacteria, and cultivating them in suitable media either for reference or in a condition to be instantly available for any experimental work for which they may be required.

While bacteria and yeasts have received considerable attention from the biotechnical point of view, the moulds have been very greatly neglected, although, on account of their enzyme-producing properties, they are of the highest importance in many of the newer branches of technology, and the uses to which they may be applied are being almost daily extended. It is true that their study lies principally in the province of the mycologist, and, with a few conspicuous exceptions (mostly by foreign workers), the investigation of these fungi outside purely biological consideration has been carried out in connection with their relationship to plant pathology.

As already mentioned, the lower fungi are of special interest to the technologist by reason of the readily demonstrated power of producing various enzymes. They have been also the subject of a good deal of attention from the biochemist, but there are few chemists in either this, or any other country, who have sufficient mycological experience to enable them to determine with certainty the specific nature of the organisms with which they may be dealing. The most important groups of fungi, from the technical point of view, are the Phycomycetes, the Hyphomycetes and certain Ascomycetes, and it is these very groups, which, even to the mycologist, present special difficulties in the differentiation of species. Therefore it is not to be wondered at, that, for the chemist, it is an almost insuperable task to accurately name a specimen of what appears to be the commonest of moulds.

Typical Cases

Take as an instance, the genus Penecillium and the confusion likely to ensue from the foregoing considerations. In the standard chemical literature of to-day there are innumerable references and papers on the bio-chemistry of blue moulds, and in nearly all cases the plant is referred to as Penecillium glaucum. Now there are some 40 to 50 distinct species of blue moulds belonging to this genus, all of which behave differently when grown under conditions identically the same. On the surface of a given medium they develop similar, although microscopically different, forms of growth and colour (mostly from pale blue to deep green), but exhibit very different reactions both chemically and physiologically. They develop different enzymes over a very wide range and produce acids of various kinds in smaller or greater quantities. The submerged portion of the growing fungus gives rise to various coloured pigments distinct from those of the surface growth, which stain the medium; some of them acting as delicate indicators, others being very resistant towards the action of both acids and alkalies. In view of such varying behaviour among species within a single genus, it is a matter of the utmost importance to the biochemist that he should be certain of the identity of the organism he is investigating. Now Thom[6], working on species of Penecillium in connection with the ripening of cheese in 1910, and Westling[7] who monographed the genus in 1911, both came to the conclusion that there is no specific organism Penecillium glaucum; at any rate, there exists no diagnosis sufficiently clear to enable a mycologist to recognise the plant to which that name was first given. The result is that a great deal of research has been expended on an organism, or rather a number of organisms, none of which can now be identified, and a voluminous biological and biochemical literature, which, under other circumstances would have been of the greatest possible service to the bio-technologist is practically valueless.

Similar difficulties confront the technologist in regard to species of the Mucoraceæ used for the saccharification of starch materials in various fermentation processes, and many of which are themselves capable of fermenting saccharine liquids with the production of alcohol up to 7 per cent. The same may be said of species of Aspergillaceæ, also possessing highly diastatic properties, an example of which, A. oryzæ, is the fungus used in Japan for the preparation of Saké, the national drink of that country. Practically all the enzymes known are found in different species of Aspergillus and some members of this family possess the special property of producing organic acids, particularly oxalic and citric acids, from carbohydrate solutions; and, undoubtedly, the production of these acids by species of fungi on a commercial scale will be accomplished at no distant future.

If the Bureau of Bio-Technology can assist in remedying the chaotic state of affairs, illustrated above, by rendering available pure cultures of such technical organisms as those referred to, this branch of its activity will be more than justified. Collections of fungi of economic importance there are, of course, in existence, but the writer knows of no other collection of organisms in conjunction with which will be found the necessary experience in their technological applications.

Not only do the moulds above mentioned find a useful application in industry. but they are, unfortunately, among some of the most destructive pests with which the manufacturer and the consumer has to contend. Considerable financial losses occur annually through the depredations of the lower fungi among cereal products, sugar and confectionery, textiles, leather, tobacco, &c., to say nothing of the vast amount of damage done by the same organisms in the agricultural, arboricultural and horticultural industries; in this connection also there is a wide field for investigation for which the Bureau of Bio-Technology is well equipped.

It is not possible in the space at disposal to do more than mention in passing the subject of yeasts and their growing industrial value. Many species occur in nature[8], the properties of which are only imperfectly known and the possibilities of their technical application still unexploited. A number of these are being isolated and investigated in this Bureau.

Industrial Bacteriology and Zoology

Industrial bacteriology is, of course, inseparable from the work of a Bureau of Bio-Technology, but to generalise on this subject here, would only result in traversing ground admirably covered in a paper by Thaysen,[9] read at the last meeting of the British Association at Bournemouth. Nor is it possible to discuss the interest attaching to the

[6] Thom, C., "Cultural Studies of Species of Penecillium," *Bureau An. Ind. U.S. Dept. Agric.*, Bull. 118, 1910.

[7] Westling, Rich., "Über die grünen Species der Gattung Penecillium," *Arkiv. for Botanik.*, XI., 1911.

[8] Mason, F. A., "On the Occurrence of Yeast-fungi in Nature," *Naturalist*, January, 1913.

[9] Thaysen, A. C., "Bacteriology, its Practical Applications and its Importance Outside Medicine," *Journ. Inst. Brew.*, XXVI., 1920.

higher plants in their relationship to industry, but the study of all aspects of botany is provided for in our laboratories.

Zoology is another branch of biological science of which little cognisance has been taken in industry, although a considerable number of animal organisms, ranging from the minute unicellular protozoa to the insects and even higher animals, involve the manufacturer and the merchant in frequent and often serious loss. Grain and other foodstuffs, tobacco, oils and fats, leather and many other commodities all have their insect or other animal pests. Except by Government Departments, which are more particularly interested in the economic aspects of zoology (mainly entomological) in relation to agriculture and horticulture, no facilities have existed hitherto for dealing with the examination and investigation of such organisms in the ordinary course of technical control. As an illustration of the necessity for such control, a case of serious damage occurring in sheep-skins during the removal of wool in the sweating process, was submitted to us for examination, thousands of pounds worth of damage having been done in one tannery alone by the agency of some pest hitherto believed to be bacterial. Our investigations proved that the organism responsible is a minute nematoid worm. The life history of this pest has been studied, and the results obtained have enabled us to devise methods for its eradication.

The reader who closely follows the literature of any department of technology must have been impressed with the fact that modern developments are ever along lines of microscopical or biological research. Formerly the microscope was kept under a glass shade in some conspicuous place in the laboratory, more as an ornament or a symbol, after the manner of the show carboys so familiar in the window of the pharmacist. To-day, that instrument has come to occupy a position in industrial technique, second only to that of the chemical balance, while in many directions it is, to say the least, quite as important as the balance. Therefore, in offering these notes on the work of a Bureau of Bio-Technology specialising in the biological and other aspects of industry in which the microscope is a *sine qua non*, the writer believes he is giving publicity to a species of service long overdue.

Colloidal Fuel

To the Editor of THE CHEMICAL AGE

SIR,—May I refer to the Editorial Note in your issue of April 10 under this heading, and through your columns inform our industrial public that private enterprise is now making rapid progress towards the supply of colloidal fuel and the development of pulverised coal applications in England?

I wish at once to correct a misapprehension on the subject of my report upon pulverised coal systems in America. You very kindly suggest that "so far the chief return for the ratepayers' money has been Mr. L. C. Harvey's admirable report on powdered fuel." This report cost the ratepayers the price of the printing only, and, perhaps, because of this fact official support of a proved method of economising some millions of tons of coal per annum, the reduction of metallurgical losses, the increased output of furnaces and boilers, reduction of labour and other attendant considerations, has been withheld.

One has again to rely upon private enterprise; at all events, so far as the supply of colloidal fuels is concerned important interests are now energetically at work to fill the gap left open by departmental apathy.

I enclose a copy of the *Power User* for April, in which a short article by me upon "Colloidal Oil" appears, and in which I have recapitulated some of the important results obtained by Mr. Lindon W. Bates.—Yours, &c.,

25, Victoria St., Westminster, April 13. L. C. HARVEY.

Colloidal Clay in Soap Manufacture

To the Editor of THE CHEMICAL AGE

SIR,—Dr. Zacharias divides chemists into two classes, "outdoor" chemists and "laboratory" chemists, and appears to claim membership in the former class. According to him, the "outdoor" chemist has known about the practical use of clay in soap since the year 1, but the "indoor" or colloidal chemist has only just discovered this use. Colloidal chemistry and its laws, apparently, mean nothing to the "outdoor" chemist and Dr. Zacharias; so much so, that he is not able to differentiate between the disintegration products of innumerable different species of rocks commonly called clay, containing all kinds of impurities, and sand; a partly colloidal clay and a clay so treated as to be wholly colloidal.

While it is gratifying to know that certain detergent processes are in practical ("outdoor") operation in South Eastern Europe, we fear that some of the more refined applications of colloidal chemistry have yet to wait for appreciation in those localities. Perhaps Dr. Zacharias would classify us among the "indoor" chemists, but we would not be averse to a wager to the effect that for every cwt. of clay he has come in contact with, we have handled a thousand tons of both partly colloidal and wholly colloidal clay.—Yours, &c.,

CATALPO, LTD.,
W. FELDENHEIMER (Managing Director).
The patentees of the wholly colloidal clay which formed the subject-matter of Mr. Weston's treatise.

19-20, Holborn Viaduct, E.C.2.
April 12.

To the Editor of THE CHEMICAL AGE

SIR,—Dr. Zacharias' letter on the above subject, which appeared in the issue of April 3 last of THE CHEMICAL AGE, is extremely diverting. Like Don Quixote, he tilts at imaginary foes. He is very much perturbed at our seeming ignorance of the detergent properties of clay, though how he comes to that conclusion does not appear. In my letter to THE CHEMICAL AGE of February 7 I state: "It is well known that china clay has been used as a filler for soap for at least the last hundred years." If Dr. Zacharias will trouble to read the article that has perturbed him so much again, he will probably discover that what we endeavour to show is that when clay is prepared so as to be wholly colloidal and free from impurities, and is properly admixed with soap, the resulting mixture possesses better detergent properties than either the clay or soap alone.

Dr. Zacharias takes exception to the term "adsorption," which he ascribes to the vagaries of fashion requiring the "b" of "absorption" to be changed to "d," thus giving the "same phenomenon" two names. I beg to differ from Dr. Zacharias that the phenomenon observed at the surfaces of a dispersed system is not the same as the phenomenon connoted by the term absorption; if I am wrong, I plead that I am so on good authority. The American scientist Willard Gibbs was the first to point out that at the surfaces of a dispersed system *a different concentration* was to be expected from that which prevails in the body of the dispersoid. Again, Hatschek says: "Charcoal, clay, and even more strikingly the gels, are all characterised by a very large surface development. Certain substances in solution are concentrated at these surfaces, and *this change in concentration is now generally called adsorption.*" Further, Hatschek says: "Adsorption is evidently opposed by the factors tending to establish uniform concentration—that is, osmotic pressure and electric charge—and the final distribution of the solute is the resultant of these three effects."

The term absorption has hitherto been used to imply a uniform concentration, and so, whether one uses the term adsorption or absorption, the phenomenon connoted by these terms are quite different.—Yours, &c.,

The Polytechnic, Regent Street, W., April 10. FRANK E. WESTON.

Book Received

THE USE OF LOW-GRADE AND WASTE FUELS FOR POWER GENERATION. By John B. C. Kershaw, F.I.C. Constable & Co., Ltd., London. Pp. 202. 17s. net.

Fixation of Nitrogen and Oxidation of Ammonia

A Review of United States Experiments

In view of the recently issued report of the British Nitrogen Products Committee the following review of similar work accomplished in the United States will be of interest. It is taken from a report, just issued by the Department of the Interior, on "War materials, nitrogen fixation and sodium cyanide."

THE work of the Bureau of Mines in connection with the development of processes and plants for insuring an adequate supply of nitric acid and nitrates in the United States ranks among its important achievements. This work, conducted in co-operation with the War Department, was the direct outgrowth of the necessity of rendering the nation independent as regards a supply of nitric acid, essential in the manufacture of high explosives, and of the nitrogen compounds used in agriculture and other industries. Such a need was recognised in the National Defence Act of June 3, 1916, which authorised the President to have made an investigation to determine the best, cheapest, and most available means of producing nitrates and nitrogenous materials used in munitions and in the manufacture of fertilisers and other products, and to have erected such plants as might be deemed necessary.

A contract with the Semet Solvay Company was signed August 10, 1916, whereby the Semet Solvay Company, in co-operation with the Bureau of Mines and with the approval of Gen. Crozier, undertook to erect in Syracuse a plant, from plans furnished by the Bureau of Mines, for the chief purpose of demonstrating whether ammonia could be successfully oxidized on a commercial scale to nitric acid, and especially whether ammonia produced by the destructive distillation of coal was as suitable for the purpose as cyanamid.

Early in 1916 the American Cyanamid Company had carried on experiments on the oxidation of ammonia at its plant at Niagara Falls, Ontario, and during the summer of 1916 had erected at Warner's, N.J., a small plant having a capacity of approximately 1 ton of nitric acid a day, for producing the acid from cyanamid ammonia by the catalytic action of electrically heated platinum. During the summer of 1916 Dr. Parsons was allowed to visit this plant, with the distinct understanding that although certain details of the process would not be revealed to him, nevertheless he was at liberty to use anything that he himself saw during his visit.

Before he left for Europe early in October, 1916, Dr. Parsons, assisted by others, prepared general plans for the erection of a small plant at Split Rock near Syracuse. The plant was to be much like the plant at Warner's, N.J., platinum gauze being used as a catalyzer. When Dr. Parsons returned from Europe in December, 1916, this plant was nearing completion. The chemists mentioned above made many experiments with the hope of utilising nonmetallic catalyzers. Many such catalyzers were found that worked successfully for a short period, but nothing to compare with platinum was ever discovered. Hence this line of experiment was abandoned; only apparatus in which platinum was the basic agent for the conversion of ammonia to nitric acid was tried.

Dr. Parsons was transferred to the War Department for the last three months of the year 1916. As chemical engineer to the Ordnance Department he visited, with Mr. Eysten Berg, the plants in France and Italy, and later alone visited the plants in England, Norway, and Sweden that were working on the fixation of atmospheric nitrogen. He returned to the United States on December 24, 1916; made his preliminary report to the Ordnance Department on January 17, 1917; and gave his final conclusions on April 30, 1917.

The work of constructing and operating the plants for the fixation of nitrogen was turned over to a special division of the Army known as the nitrate division, Ordnance Department, under Col. J. W. Joyes. Work on the oxidation of ammonia continued for some time at Syracuse, and the nitrate division also established a small experimental laboratory of its own at Sheffield, Ala., for studying the oxidation of ammonia.

Modified German Apparatus

It was early determined that the German apparatus, as modified by W. L. Landis of the American Cyanamid Company, would readily oxidise ammonia from by-product coke with high efficiency, but so much electricity was needed to maintain the heat of the single sheet of platinum gauze used that a method using no external heat was plainly desirable, especially as there was a large amount of waste heat from the reaction. The first modification of the apparatus was to use three or four layers of platinum gauze in the hope of reducing the proportion of heat radiated. This hope was realised and apparatus of essentially the same shape as that previously used, but having multiple gauze, worked fairly well and gave fairly high efficiencies.

Dr. Parsons had already given the experimenters data on apparatus used in England and France. Additional information on the multiple-gauze apparatus was now sent to the European representatives of the Semet Solvay Company, and became the basis of experimental plants that were constructed in England except the large plant erected at Dagenham Docks which used the Ostwald process developed at Vilvorde, Belgium, before the war.

Although the experiments with the multiple-gauze apparatus gave fairly good results, they were not entirely satisfactory, as the temperature of the gauze was not maintained at the point most desirable for high efficiencies. After considerable thought, an apparatus was developed and patented by Dr. Jones, of the Semet Solvay Company., and Dr. Parsons. In this apparatus the layers of platinum gauze were arranged within a cylinder made of refractory material. The layers of gauze radiated to each other and also raised the walls of the refractor cylinder to a red heat so that it in turn helped to maintain a high temperature. With pure ammonia this apparatus proved a complete success; one single apparatus was in continual use day and night for six months at the plant of the Semet Solvay Company, and gave an average efficiency of more than 90 per cent. This form of apparatus was adopted for Chemical Plant No. 1 at Sheffield, Ala.

Another important development of this work was the determining of the impurities that are liable to be present in ammonia and must be removed to insure oxidation with high efficiency. These impurities are chiefly iron in any form, oil or similar organic material carried mechanically, and phosphine. The last has a very poisonous action, but it is present only in cyanamid ammonia and can be readily removed.

Sodium Cyanide by the Bucher Process

Reports from France received by the Bureau of Mines indicated strongly that hydrocyanic acid was desirable for gas warfare. The French were preparing to use it in shells and were trying to purchase cyanide in America.

On September 7, 1917, the Secretary of the Interior wrote to the Secretary of War calling attention to the Bucher process of the Nitrogen Products Company, and offering the services of the Bureau of Mines in constructing and operating a plant for making sodium cyanide.

Plans for the plant were prepared as rapidly as possible after the funds were made available. The early plans were for a 15-ton plant. As later advices from France, transmitted to Capt. Ragsdale on December 14, indicated that the probable use of cyanide would be less than previously anticipated, the plans were changed to a 5-ton basis.

On December 27, 1917, the Chief of Ordnance set aside $750,000 to cover the cost of a 5-ton plant. On January 8, 1918, a communication received from the Director of the Research Division of the Gas Warfare Service stated that a committee, which had considered the need for cyanide, believed that a 5-ton plant was not large enough and recommended the building of a 10-ton plant. Because of this recommendation the Ordnance Department was asked for more funds on an estimate that the 10-ton project would cost approximately $2,000,000, as cantonments and other requisites for an enlisted personnel of 350 men and 25 officers would have to be provided at the site chosen.

Construction

The preliminary engineering work proceeded rapidly and was nearly completed by the time contracts were signed, February 28. Work at the site begun March 1 and construction proceeded rapidly, the only delays being those from inability to obtain structural steel in the months of May and June. The construction work carefully followed the plans of the engineering staff employed by the bureau and was subject to the direction and approval of Dr. C. L. Parsons, in

charge of the work. Outside of the cantonment buildings, roads, filtering plant, electric installations, sewers, fire protection, and other subsidiary details, the main plant itself had three essential divisions housed in three main buildings, known as the mechanical, retort, and lixiviator buildings. The original intent was to obtain the nitrogen from the waste gases of the carbonating towers of the plant of the Mathieson Alkali Company at Saltville, and the original contract provided for the nitrogen being furnished by that company. It early became evident, however, that the cost of a plant for producing this nitrogen would be excessive and that there was no definite assurance that nitrogen could be procured regularly. Accordingly, the plans for the production of pure nitrogen were radically changed and arrangements were made with the Air Reduction Company of New York for erecting three Claude towers. These towers were built and installed.

The land within the plant survey comprised some 35 acres rented from the Mathieson Alkali Company with the privilege of purchase.

Plant Put in Operation

The few units that had been previously turned over to the operating department functioned well. The plant was running successfully, though not on full scale, when the armistice was signed on November 11. Orders were immediately issued by the Chief of Ordnance to slow down work, and thereafter for a few weeks one bank of furnaces was run to obtain data. A few changes in burner design and furnace construction were necessary, but these were minor and easily made.

There is no question whatever that the plant will produce sodium cyanide to the full capacity for which it was planned. On November 11 the plant was 190 men short in its personnel for full operation. The total funds allotted for the plant amounted to $2,800,000 and approximately $2,522,000 was spent in construction and early operation.

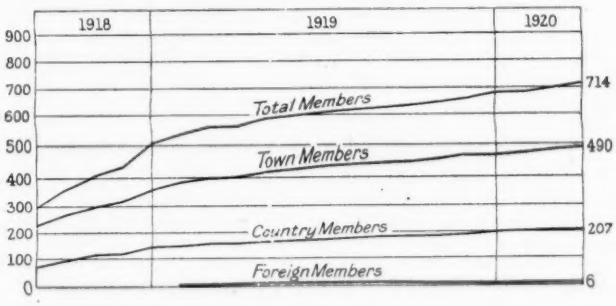
Plant Turned Over to Ordnance Department

On November 26, the Secretary of the Interior informed the Secretary of War that the plant had been tried out and was working properly, and that he was ready to turn it over to the Ordnance Department for operation. The Secretary of War then assigned the future control of the plant to the nitrate division and on December 21, 1918, the control of the plant and its personnel passed from the Bureau of Mines to the Ordnance Department.

In considering the success achieved one should remember that the Bucher process was new and had never been tried on an extensive manufacturing scale, although the experimental plant erected at Saltville gave much data for the construction of the larger plant. The plant as constructed will produce cyanide at a price much lower than it could have been purchased in the open market.

Chemical Industry Club Membership

THE following diagram shows at a glance the satisfactory and consistent progress in membership which the Chemical Industry Club has made from its establishment. With the arrangements now under consideration for making the advantages and claims of the club more widely known, it is hoped that by the close of the year the membership will not be far, if any, short of the desired thousand. Mr. H. E. Coley, the hon. secretary, to whose tact and devotion the success of the club is so largely due, is about to leave England for some months on a visit to Borneo and other parts, and during his absence his secretarial work will be undertaken by Mr. Bernard Davis :—



Review

A CLASS BOOK OF ORGANIC CHEMISTRY. By J. B. Cohen, Ph.D., B.Sc., F.R.S. Vol. II., for second year medical students and others. Pp. 1—156. Messrs. Macmillan & Co., Ltd. 4s. 6d. net.

This excellent little work has been written specially for the ordinary medical student who has spent one year at organic chemistry, the subject matter having been chosen as specially appealing to the medical student in his later studies. It should, however, be at once stated that the book will also form an admirable introduction to those students of chemistry wishing to keep in touch with modern thought, and that it forms an appropriate link between the ordinary text-book of chemistry and the journals recording original work. That the ground covered by the author is both interesting and of material use to the medical student is shown by the following epitome of the ten chapters of which the book consists: Synthesis—The Oils and Fats—The Carbohydrates—Some Natural Organic Bases—The Pyrimidine and Purine Groups—The Proteins—Fermentation and Enzyme Action—The Essential Oils—The Alkaloids—Synthetic Drugs.

The introductory chapter on Synthesis deals with the various types of reaction used in synthesis, each type being illustrated by some well-known example both theoretically and practically; the combination of theory and practice has been happily blended throughout the book. Reference is then made, in brief outline, to the application to modern problems. In such a small book it is impossible to go deeply into the subjects chosen, but the author has succeeded in condensing into 156 pages a great deal of useful information; this is particularly noticeable in the chapter on Oils and Fats.

In every chapter of the book the author has something to say, even if only very briefly, on the latest ideas and developments of the subject under consideration, and it is gratifying to notice that colloidal chemistry is slowly but surely being called upon to explain phenomena that have hitherto been entirely empirical; in the chapter on fermentation a short reference is made to the probable colloidal nature of enzyme action in fermentation. Doubtless, in the immediate future we shall learn that many reactions that are now obscure are due to the colloidal nature of one of the bodies in the reacting system.

The chapter on Synthetic Drugs should especially appeal to the medical student, as the author very clearly shows the underlying principle upon which the development of this branch of medicine is based. The principal classes into which drugs may be divided are narcotics, antipyretics, antiseptics, mydriatics, synpatho-mimetics and protozoacides. Particular attention is drawn to the fact that the action of a drug of a particular class is due to the presence of a special radical, and that the action of the drug is modified by slight alterations on this radical.

As previously stated, the book forms an admirable connecting link between the text-book and the scientific journals, and from this point of view it can be heartily recommended not only to the advanced medical student whose time is naturally limited in the study of chemistry, but also to the chemical student who wishes to proceed from the study of the text-book to the study of original Papers. F. E. W.

Growth of Japan's Chemical Industry

THE chemical industry spent more money in the extension of its plants in 1919 than any other industry in Japan. During the year 47 factories were enlarged, and 33,957,000 yen was added to the authorised capital of chemical companies. Of the 213 manufacturing companies which went out of business during 1919, 57 were chemical works, the authorised capital totalling 26,638,000 yen. This may be accepted as the effect of the reaction brought about by the cessation of the war. Japan enjoyed a sudden and abnormal importance in the chemical industry during the war, and the success of the well-established firms tempted inexperienced men to take chances. Many of the firms started during the war period are enjoying a growing business.

Notes on the Nitrate Industry of Chile

By M. A. Bertrand

"Chimie & Industrie" publishes an interesting statement communicated by M. A. Bertrand to the Société de Chimie Industrielle on the results of a personal investigation of the nitrate industry in Chile, in which he advocates reforms in the present methods of obtaining nitrate, which he considers to be inadequate to the present conditions. A summary of his investigations is given below.

THE nitrate area extends in an irregular belt for about 400 miles between the coast range and the foot of the Andes, while the width varies from 3 miles to 25 miles. It is served by a series of ports on the Chilian coast, the principal being Iquique, Mejillones, Antofagasta and Taltal. An interesting and detailed description of the topography of the country, its ports, and means of communication is given, and incidentally it appears that the seven railways serving the nitrate area are constructed of four different gauges, a fact which produces considerable inconvenience.

The main nitrate beds are covered by three horizontal strata, although one, or sometimes two, may be missing. The surface bed or "chuca" is a greyish material containing 45 to 65 per cent. of silica and a very variable amount of nitrates, chlorides, sulphates, carbonates, phosphates and iodates of sodium, potassium, magnesium, calcium, iron, aluminium, manganese, &c., with usually a considerable proportion of crystallised sodium sulphate. The next bed or "pancake" is a "chuca" of spongy appearance, less friable, and richer in calcium sulphate. The "costra" (crust) is a conglomerate containing 40 to 70 per cent. of insoluble material cemented together by soluble salts containing 10 to 15 per cent. of sodium nitrate. The main nitrate bed is the "caliche," which is an extremely complex and variable conglomerate containing insoluble material up to 50 or 60 per cent., cemented by a mixture of soluble salts. These salts may contain a maximum of sodium nitrate 80 per cent., potassium nitrate 5 per cent., sodium chloride 60 per cent., magnesium chloride 1 per cent., and sodium sulphate 10 per cent., with iodates up to about two parts of iodine per 1,000. Small quantities of borates, chromates, perchlorates and vanadates may also be present. In all cases the average quantities are considerably less than the maximum proportions given above. The "caliche" may vary in colour from white to black, according to the presence of coloured salts containing manganese, iron, chromium, iodine, &c. The physical structure is equally variable, the commonest being a conglomerate containing stony nodules. The density of the "caliche" varies with its composition, the maximum being about 2·3.

Below the "caliche" are three additional strata, the "conjelo," a conglomerate containing sodium sulphate and chloride up to about 75 per cent.; the "banco," which is an inferior kind of "caliche," and is capable of being worked; and the "coba," another conglomerate which rests on the volcanic rock.

Extraction of the Nitrate

Bore holes are made about 100 yards apart, usually by excavation but sometimes by explosives, and are arranged in groups of four or six. Statistics are kept by the Chilean Government of all results obtained. The problem of obtaining the nitrate is comparatively simple, since it is simply mixed with other salts, principally sodium chloride, and no chemical reactions are necessary.

The solubility curves of pure sodium nitrate, pure sodium chloride, and of sodium chloride and sodium nitrate each in presence of the other are illustrated, and it will be seen that while the solubility of nitrate in a mixed solution rapidly increases with temperature, that of chloride slowly decreases. The theoretical considerations, therefore, suggest the obtaining of a hot saturated solution of the soluble salts of the "caliche" and then the precipitation of the nitrate by cooling. From the point of view of fuel economy, however, it is necessary to consider whether it would be more advantageous to dissolve out the soluble salts with cold water to avoid heating the insoluble material, and then evaporate to obtain a hot concentrated solution; or, alternatively, to dissolve out the salts with hot water in

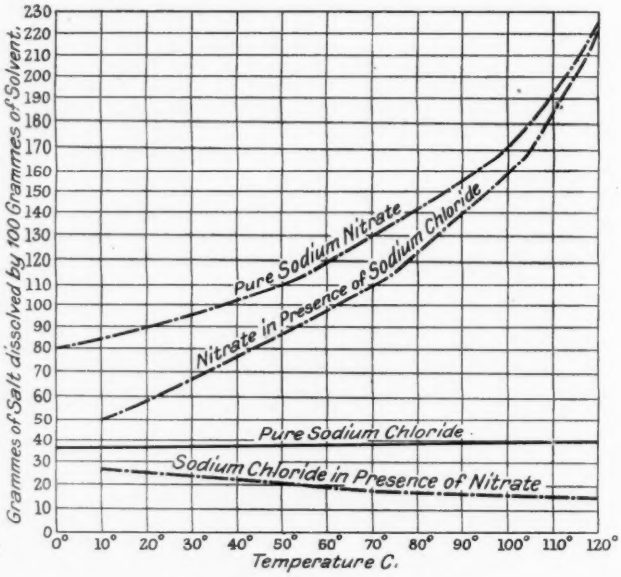

Grammes of Salt dissolved by 100 Grammes of Solvent.
Temperature C.
Pure Sodium Nitrate
Nitrate in Presence of Sodium Chloride
Pure Sodium Chloride
Sodium Chloride in Presence of Nitrate

FIG. 1.—SOLUBILITY CURVES.

the first instance, thus avoiding the cost of evaporation. In practice the second method is always used, but it is doubtful whether it is the best for treating a "caliche" with a low content of soluble salts.

Development of the Extraction Process

In the early years of the industry the material treated was naturally that in which the nitrate content was highest, *i.e.*, from 60 to 80 per cent. The rich "caliche" was treated in circular vats with the liquor from a previous extraction, water being added if necessary, and the liquor was raised to boiling point by the heat from a fire. The concentrated solution was run off to settling vessels where suspended material was deposited, and the clear solution was transferred while still hot to crystallising vessels. The residue still contained 15 to 25 per cent. of nitrate and was sometimes submitted to further treatment, but in the main the object was to obtain nitrate at the lowest cost by using the richest material.

This method continued up to 1856, when some improvements were introduced, notably the substitution of heating by steam injected into the liquid by perforated pipes, the liquid thus being agitated at the same time. The vats were also replaced by rectangular tanks of the "Cornish" type, often of very large size. Later the perforated steam pipes were replaced by closed steam coils to avoid the

dilution which occurred, due to the condensation of the steam. During this period, the neighbourhood of the works became encumbered with residues consisting of gravel containing 20 to 30 per cent. of nitrate, and mud containing 40 or even 50 per cent. of nitrate.

In 1876 Shanks' process of lixiviation was introduced. It is carried out in one or several series of rectangular vats on the same level, on the well-known counter-current principle; the details are promised in a following article. Some defects of the process are at once apparent in this process. When the concentrated liquor is transferred to the settling vessel, it is not possible to ensure that the liquor shall be withdrawn at a temperature when it still contains the whole of the nitrate, and in this way some of the salt may be lost. On the other hand, if the temperature is too high, an excess of sodium chloride will be retained and will pass to the crystallising vessels with the nitrate. The solution is left to crystallise for 8 to 10 days or more, and about 1,700 gms. of nitrate or about three-quarters of the whole amount is deposited per litre of water. Altogether

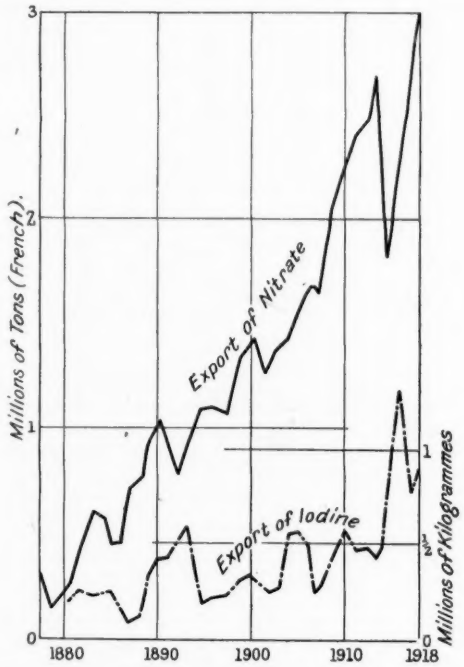


FIG. 2.—CHILIAN EXPORTS OF NITRATE AND IODINE, 1878-1918.

about 55 million tons of nitrate have been extracted by this process, the rate rising from 300,000 to 3,000,000 tons per annum. The very rapid rise in the consumption of nitrate, and the slower rise in the consumption of iodine extracted from it are shown graphically.

Defects in the Extraction Process

This system, which may have been reasonably efficient when the "caliche" contained 50 per cent. of nitrate, is in need of improvement now that the nitrate does not exceed 15 to 20 per cent., and the loss of heat energy in heating about 40 to 60 per cent. of insoluble material is now a considerable item. The persistence in the use of Shanks' process is probably accounted for by the very gradual deterioration in the quality of the "caliche" treated, and unfortunately there has been no adequate research for a better process. With the "caliche" now treated much larger quantities of water must be used, and it is practically impossible to obtain a saturated solution without having recourse to concentration, which involves additional fuel. In 1885, 1 unit of coal was used in producing 12 units of nitrate, but at present the yield of nitrate is only 2·5 to 5 units for 1 unit of coal.

The saturation of so much inert material with nitrate solution also involves loss of heat when the hot solution is gradually replaced in the lixiviating tanks by the colder solution from another tank. Some doubt also exists as to the correctness of the tables of solubility in current use, owing to the complex nature of the mixture of salts. Further, difficulties arise due to the fact that the theoretical principles governing the equilibrium points between solution and crystallisation of the salts do not always hold in presence of the impurities (especially colloidal) which are found in practice, and super-saturation is liable to occur. It is suggested that the three steps of solution by heating, saturation by evaporation, and crystallisation by cooling, do not necessarily constitute the best method of obtaining the nitrate, but that methods might be found for varying the solubility of sodium nitrate other than by temperature variation. Attention is also called to the fact that the solution of sodium nitrate is strongly endothermic and the crystallisation is exothermic, and some substance may be found which would have a catalytic effect in preventing super-saturation. A further difficulty is in the fact that it is not possible to ascertain the nitrate content of the solutions dealt with by measuring their temperature and density, owing to the presence of other salts in unknown amount.

A Glass Amalgamation

Triplex Safety Co. and British Glass Industries

AT an extraordinary general meeting held on Thursday, April 8, resolutions were passed approving an agreement made with the British Glass Industries, Ltd., and increasing the capital of the Company. The scheme, which was evolved in order to increase the supply of glass, the Company's essential raw material, provides for the increase of capital from 200,000 to 300,000 shares of £1 each. 180,000 of these 300,000 shares remain unissued, and British Glass Industries, Ltd., will take 150,000 at par. With the cash thus available, the Triplex Company will take 75,000 £1 shares in British Window Glass, Ltd., which is one of the companies controlled by British Glass Industries, at £2 each. British Glass Industries agree to use their utmost endeavours to supply the Triplex Company with the glass they require, commencing at the earliest possible date, British Window Glass undertaking the work as a special obligation. The British Motor Trading Corporation, Ltd., are to be given an option for two years on 20,000 £1 shares in Triplex Safety Glass at par in exchange for an engagement to forward the use of the Company's glass in the cars they deal with, together with its standardisation therein as far as may be possible from time to time.

Opposition came from some of the shareholders, on the grounds that as Austria and Germany were now manufacturing glass, a great amount would be imported into this country, and that a sufficient amount of glass for the purposes of the company would be forthcoming. It was proposed that the meeting should be adjourned in order to enable the board to approach British Glass Industries with a view to either buying the company out or getting better terms. Mr. R. B. Sparks considered that the board had made a very bad bargain. The resolutions approving the agreement, were, however, carried.

THE DIRECTORS of the Sandos Chemical Works, Basle, Switzerland, have sent a donation of £100 to the Appeal Fund of Manchester University, which is endeavouring to raise a sum of £500,000 for present requirements and future developments. In a covering note the directors say that the donation is "in appreciation of the services the University of Manchester has rendered to the technical side of the dyeing trade." Donations have also been received from the Société of Chemical Industry at Basle, and from Messrs. J. R. Geigy, Society Anonyme of Basle.

The Society of Chemical Industry

Papers Before the London Section

At the meeting of the London Section of the Society of Chemical Industry on Monday, April 12, a Paper on "The Fertilising Value of Sewage Sludges," by Dr. Winifred E. Brenchley and Mr. E. Hannaford Richards was read and discussed.

A great many field trials had been made of the fertilising value of sewage sludge in comparison with artificial manures, but the results had all shown that the fertilising value was very low. The most serious trials of this kind were undertaken 12 years ago by the Royal Commission on Sewage Disposal, and there had also been some pot culture trials by Dr. Volcker on behalf of the Royal Agricultural Society. It had been argued that it was not fair to compare the nitrogen in a sludge with that in say, sodium nitrate costing £20 per ton, but giving every possible chance to sewage sludge the results of the early experiments showed that it was of very low value to the farmer. Within the last 10 years, however, at least two new methods of treating sewage which were not available at the time the Royal Commission made its trials had been brought into use, viz., the treatment of slate bed sludge and later, activated sludge. Both processes yielded sludges of a definite manurial value, as had been now known for some time, but so far no comparative results of slate bed and activated sludges had been published. Slate bed sludge was superior to ordinary tank sludge, but tests of its manurial value showed it to be entirely inferior to activated sludge as a fertiliser. The waste involved in our methods of sewage disposal had been recognised for half a century, but now, thanks to recent researches in bio-chemistry, it was possible that an appreciable part of the soluble nitrogen might be recovered for the benefit of agriculture. Experiments had been carried out at Rothamsted at the request of the Ministry of Agriculture with activated sludge to ascertain whether that process offered a reasonable prospect of giving a greater return of nitrogen for manurial purposes than ordinary sludges. Tests were first made with samples of activated sludge obtained from Dr. Ardern at the Withington sewage works of the Manchester Corporation, but later a plant had been erected at Rothamsted for the purpose, and test figures had been obtained with activated sludge, slate bed sludge and precipitated sludge. The experiments were in the form of pot culture and the activated sludge and slate bed sludge was compared with nitrate of soda applied in a similar amount. The first test was with four pots of barley, and photographic slides were exhibited showing the difference in the growth under the various conditions. Whilst the slate bed sludge showed a considerable increase in growth over the untreated soil, it was not so great as in the case of the activated sludge. Both the pots treated with nitrate of soda and slate bed sludge were a fortnight later, and figures were given showing the relative rates of increase over untreated pots as follows: Sodium nitrate, 51 per cent.; activated sludge, 65 per cent.; slate bed sludge, 32 per cent. The soil in the pots was then turned over and mustard was sown. Whilst in the pot which was not treated, the first crop of barley had practically exhausted the manurial constituents, in the case of the activated sludge and the slate bed sludge there was a considerable residual value, whilst in the case of the sodium nitrate there was still more. So far as the experiments had gone they had convinced the authors that the activated sludge process was a valuable one if only a commercial process of drying the sludge, which contains 98 per cent. of water when it leaves the tanks, could be overcome. Whilst there were now comparatively few sewage works where slate beds were used, the sludge from them had a definite value and farmers in the neighbourhood of such works are recommended to give the use of this sludge their attention.

Discussion

The CHAIRMAN said that the development of the activated sludge process had opened up an entirely new field of work since the Royal Commission on Sewage Disposal had last reported, and it was of the highest national importance if a material of high manurial value could be obtained in this way. The serious difficulty seemed to be dewatering and the cost of aeration.

Dr. S. RIDEAL said the high potash and phosphorous content of the Withington sludge was remarkable. The potash content was 1·12 per cent., whereas other sludges only had traces. Was the potash present in some unknown insoluble potassium condition? Again, the percentage of phosphorous was 3 per cent., whilst other sludges contained but very small quantities. He was inclined to think that the better fertilising value of activated sludge was due to these two plant constituents rather than to the nitrogen content, to which most attention had been given hitherto, and consideration might be given from this point of view. Speaking of sludges generally, however, he mentioned that their greasy nature was not conducive to their availability as fertilisers, and it might be that even activated sludge would not be the final form in which it would be used. Distillation offered possibilities of getting the ammonia and the potash and other volatiles, so that these by themselves would be available for fertilising purposes. Then, again, it was possible to recover the soluble nitrate from the filter beds if it could be allowed to evaporate naturally whilst protected from the weather, and if we could arrive at some means of concentrating the nitrates in highly nitrated filtrate, that would be a further step forward. Certain experiments carried out some years ago showed that this was possible and he looked forward to developments in that direction.

Mr. HUGHES said the difficulty hitherto in using sludge was to get rid of the water, but that difficulty had now been overcome. By spreading the sludge out in thin layers he had dried it to the consistency of rock, whereas originally it contained 63 per cent. of water. It could then be ground finely and made a very useful manure.

Mr. SAMS expressed the opinion that a better comparison would have been made if the authors had compared activated sludge with ordinary sewage as it ran into the tank, and not with the slate bed and pressed sludge.

Mr. CALVERT (Ministry of Health) said the difficulty was that there were so many varieties of sewage to deal with. There were chemical sludges, sludges with trade waste, sludges with a high percentage of grease and sludges with no grease at all, but a process was in successful operation at Huddersfield in which the grease was extracted from sewage sludge by means of a solvent, the resulting sludge being sold as a fertiliser.

Mr. RICHARDS, in his reply to the discussion, said that while he could not account for the high percentage of potash in the samples of sludge from Withington, he was inclined to suggest that the high proportion of phosphorous was due to the phosphorous cycle acting in building up the phosphorous in the same way that the nitrogen cycle built up the nitrogen. Insufficient attention had been given to this hitherto. Practical experiments were to be carried out at Rothamsted with activated sludge with a view to finding out what was responsible for the large increase in the nitrogen content of activated sludge, compared with other sludges, and whether it was derived from atmospheric nitrogen. The nitrogen content varied from 6 to 6·8 per cent. The possibilities of distillation resolved themselves largely into an engineering question and the relative cost of fuel. It seemed doubtful whether it would pay now in view of the cost of fuel. Laboratory experiments in this matter were not comparable with field experiments because they were carried out in a glasshouse protected from rain. The only water given was that required from time to time, so that the result was rather better than would be obtained in the field. In the field, however, he thought that in most cases if the sludge were not taken up by the first crop there was a reasonable prospect of it being taken up by the second. The experiments at Rothampsted were not yet complete and whether they were satisfactorily completed depended upon the amount of the grant which was obtained from the Board of Agriculture.

A New Test for Incorporation

In a Paper entitled "A New Test for Incorporation," Dr. E. P. Perman gave particulars of some experiments which he had carried out in order to develop a laboratory test for incorporation whereby the working of the edge-runner mills—when this method was adopted for the incorporation of ammonium nitrate explosives in preference to mixing in a machine provided with blades or stirrers, or melting the aromatic nitrocompound in contact with dry powdered ammonium nitrate and stirring the product until it was cold—could be tested and controlled without entering upon the controversial questions involved in measuring the power and violence of the explosive. The process of coarse mixing could be followed by ordinary

analysis. Thus if the two components, *i.e.*, ammonium nitrate and T.N.T., were introduced into a mill on opposite sides of the pan, and 10-gram samples taken, the maximum and minimum proportions of the two components could be detected during the early stages of the mixing, but after several minutes mixing this could no longer be done. Coarse mixing was usually complete in about four minutes, at which period ordinary analysis failed to detect the improvement in the quality of the powder which resulted from further milling. To trace the subsequent incorporation of the two constituents in the rough mixture it was necessary to reduce the weight of the sample used for anaysis until the composition of the sample would be distrubed very seriously by the presence of a single grain of unmixed ammonium nitrate or T.N.T., and in the case of explosives containing ammonium nitrate it had been found possible, by the method of test which had been devised, to reduce the weight of the samples taken out of the pan for analysis from 10 grams to 1 milligram, and still to obtain results showing an average error of analysis of not more than 1 per cent. Figures were given in the Paper showing the effect of time, weight of sample and speed of milling on the degree of incorporation. The sensitiveness of the method, it was pointed out, depended on the extent to which the weight of the minute samples could be reduced without provoking excessive errors, and reduction to 1 milligram had been found possible by the test in question. The working out of the test was followed in detail in the Paper.

Experiments on Decrepitation

Dr. T. Martin Lowry then gave a short note on some experiments on decrepitation, and gave some figures with regard to barytes showing that crystals of barytes containing little water decrepitated to coarse crystals, while those containing a large quantity of water break down to a fine powder. Common salt was, as far as he knew, the only other substance which decrepitated like barytes, but he was trying to get samples of other substances to ascertain if they acted in this way, and he particularly wished to obtain a sample of strontium sulphate.

Annual Meeting of Manchester Section

At the annual general meeting of the Manchester Section of the Society of Chemical Industry, held at the Grand Hotel, Manchester, on Friday, April 9, Mr. John Allan presiding, Messrs. Lapworth, Bentley, Horner, Wollaston and Gaunt were elected members of the committee, and Messrs. Clanahan and Steven were re-elected as auditors.

The Chairman, in his annual address, said that the past session had been an extremely successful one. The attendances of members had been very large, and there had been a considerable diversity of Papers. The membership had been greatly enlarged, and was now 635, and it was quite apparent that though the Section was an old one it was beginning to renew its youth. A large proportion of the new membership was composed of young men. He hoped to see the social side of the section developed even more in the future than it had been in the past.

The hon. sec. (Mr. L. Guy Radcliffe) presented and read his annual report of the work done during the session, of which full records have regularly appeared in THE CHEMICAL AGE.

Carbon Dioxide Recorders

In a Paper on "Carbon Dioxide Recorders and their Application in Boiler Efficiency Control," Mr. B. A. Oldham said that much had been said in the past with reference to CO_2 indicators and recorders, and yet there were many steam users who were without some means which enabled them to produce a daily record showing what had actually taken place in the boiler furnace. It was universally acknowledged that the most reliable method of controlling combustion was by means of a continuous analysis of the flue gases and by determining the percentage of CO_2 they contained. Carbon dioxide was formed by the chemical combination of carbon with the oxygen contained in the atmospheric air admitted into the furnace. To effect the simple combustion of a known quantity of fuel of given quality a certain amount of atmospheric air was required, and just that amount, no more and no less, should be admitted into the furnaces. As the percentage of CO_2 was directly dependent on the quantity of air admitted it was this percentage of CO_2 which disclosed whether or not the correct conditions prevailed for such complete combustion. From the above brief description it was obvious that a CO_2 indicator or recorder was a necessity in every boiler house, to enable a fireman to see at a glance what was taking place in the furnace.

Illustrations were then shown of the W. R. CO_2 indicator, the Sarco CO_2 recorder, the S.A.W. CO_2 recorder and the Auto CO_2 recorder.

Many CO_2 recorders had been condemned in the past owing to the fact that the makers relied too much upon the clearness of their printed instructions instead of making a point of sending experienced men to supervise, while, on the other hand, credit must be given to other manufacturers of CO_2 recorders for the valuable research made in connection with combustion and in teaching coal consumers how to economise.

At the conclusion of the Paper Mr. T. R. Wollaston described an apparatus which he had designed for the purpose of automatically recording CO_2 and illustrated his remarks by a slide of the instrument.

Chemical Trade Inquiries

LOCALITY OF FIRM OR AGENT.	MATERIALS.	REF. NO.
South Africa (Durban)	Glassware	479
Belgium (Charleroi)	Industrial Oils	482
Italy (Bologna) ... (Milan) ...	Chemicals for Soap-making ... Chemicals for Soap, Stearin and Paper Works, Tanneries, Textile and Glass Factories	533
New Zealand (Auckland)	Chemicals of various kinds	521

WE have received an inquiry for chlorine in bombs from Messrs. Nerliens Kemisk Tekniske Aktieselskap, of Kristiania, Norway.

H.M. Consul at Pará states that catalogues relating to machinery employed in the manufacture and refining of sugar would be welcomed at the Consulate at Para.

Transport of Fertilisers

MR. Royce asked the Minister of Transport if he was aware that the goods agent at Holbeach station had been refusing to accept transit of fertilisers to that station from Bradford, and at a later date permitted only such limited quantities as he thought fit, without reference to the requirements of the farmers; whether he realised that, in principle, the effect of such obstruction of transit was to deny to farmers their right to determine for themselves the quantity of fertilisers their farms require?

Mr. Neal: I am informed that the traffic in question was consigned to "wait order." In order to prevent congestion and undue detention of wagons the railway companies have adopted a rule that traffic of this nature is not to be accepted for conveyance until the goods agent at the receiving station has in his possession instructions for its disposal. I am satisfied that this rule is necessary in the interests of traffic and causes no undue disadvantage to traders. In this case there was no undue delay in the acceptance of the traffic; but, on the other hand, notwithstanding the precautions taken, the four wagons in which it was conveyed suffered a total detention of 12 days after arrival. The reasonable facilities which the railway companies are under statutory obligation to afford do not include the provision of wagons for storage, and I do not see my way to give any directions which would result in the wasteful use of wagons at the present time.

AT Newcastle Police Court last week, E. G. Power was fined 20s. for selling 2 oz. of sweet spirit of nitre which was deficient in ethyl nitrate to the extent of 18·6 per cent. of the minimum allowed; and a similar penalty was imposed on T. Noble for a like offence, the deficiency in the latter case being 24·6 per cent. For the defence, it was stated that the deficiency arose from evaporation. There were warranties from the manufacturers, but these did not cover any loss through evaporation. It was not suggested by the prosecution that there had been any adulteration.

Analysis of Paints and Varnishes

A Paper by Mr. A. de Waele

AT the April meeting of the Oil and Colour Chemists' Association, held on Thursday, April 8, Mr. H. Morgan in the chair, a Paper on "The Analysis and Valuation of Paints, Varnishes and Enamels" was read by Mr. A. de Waele..

The system of oil analysis, which the author explained in detail, was intended to supply those factors which examination by the ordinary means did not yield, and which were necessary to supply much of the information needed as to the composition and behaviour of an oil varnish in actual use.

The basis of the process was as follows: Relegating the several constituents of oil varnishes into the following—(*a*) volatile distillate, (*b*) drying oil, (*c*) resins, (*d*) mineral matter—the relative elasticity was dependent on the proportion of oil to resin. Basing the differentiation of fatty oil and resin—*i.e.*, resin and gum-resin, on certain considerations given in detail in the Paper—the procedure adopted was to determine the following factors: (*a*) Volatile matter, (*b*) unsaponifiable matter, (*c*) petroleum ether insoluble fraction of acids, (*d*) unesterifiable acids.

The interpretation of the results obtained by the quantitative determination was a matter requiring careful consideration, and the determinations of composition must be supplemented by practical tests, which might be summarised as follows: (1) Appearance, (2) odour, (3) viscosity, (4) drying, (5) resistance to weather, (6) resistance to immersion in water, (7) general behaviour.

Turbidity in a varnish might be attributed to many causes, but the main cause of turbidity in new varnishes was to be sought for in the formation of the lead salts of the saturated acids from the oil which separated out, in varying degrees of dispersion, in a few days after cooling. Apart from aesthetic considerations, odour was a factor of small importance.

The subject of viscosity was one relating entirely to the physical property of the resin oil combination when correlated with the content of volatile distillate, excepting that, in general, white spirit produced a somewhat higher thinning effect or reduction of viscosity than a similar proportion of turpentine. Thus, a low viscosity in conjunction with low volatile matter content would indicate a low proportion of gum-resin, or a low degree of polymerisation of the oil. An indication as to the method of manufacture of a good size might thus be obtained by determination of these two factors. Beyond this, the determination of viscosity would indicate the spreading power and degree of thickness of the coating applied.

In connection with drying, the author preferred to run two series of tests, one on small glass strips on to which the varnish was flowed, and the other on prepared surfaces of varnished wood on to which the varnish was carefully applied by a brush after flatting. As to weather resistance, this might be determined by an actual exposure test; but when a report was required within a few days this would not be feasible. The author, therefore, adopted the following, which arose from a case in which a series of varnish films showed great differences in behaviour under conditions of application on coach bodies. A permanent marring of the surface was observed in certain of the films after exposure to rain, and, on investigation, this was found to be quite dissimilar to the well-known chalking by water. Moreover, the erosion—for such it proved to be on microscopic examination—appeared to be less severe in the cases where much of the exposure had been in towns. This gave a clue that dissolved oxygen in rain water might be the active constituent. Repetition under laboratory conditions was made by spotting the dried films with 20 volumes hydrogen peroxide, allowing this to evaporate in a dessicator, washing off the residue with distilled water and drying with a moist chamois leather. The results exactly confirmed the exposure test under practical conditions. The test was, therefore, carried out as described, the only noteworthy point being that it was occasionally difficult to distinguish true corrosion from a peculiar blistering that arose with some very elastic varnishes. This, however, was done in the subsequent test of immersion in water, when, in cases of blistering or pseudo corrosion, no differences in the degree of chalking on immersion would show themselves, the reverse being the case with true corrosion.

Results Obtained

Since the actual valuation of a varnish, as determined by the methods described, would be of little value except in the hands of a skilled varnish chemist, the author did not append more than a few tables to the Paper giving the results accruing from some varnishes which proved to be satisfactory on practical trial.

In the case of undercoating, coach varnishes showing a good weather resistance and a good resistance on immersion, together with a low resin content—*i.e.*, less than 25 per cent.—on non-volatile portion of the varnish, the ash limit was 2·5 per cent. Manganese must in no cases exceed 0·05 per cent. and cobalt 0·01 per cent. Ash affected elasticity directly as gum, so that high ash must be accompanied by low gum-resin. The hardness of the gum sometimes (but rarely) modified the gum resin content. The ratio of gum-resin in undercoating to finishing varnish should be about 1 : 1·3, calculated on the spirit free varnish.

For finishing coat varnishes, the following are taken from the results given: Viscosity, 60–40; drying, must be set to the touch in 12 hours and be incapable of being finger marked in 48 hours. Certain "body" varnishes, however, need not be so hard set as this; weather resistance, must be practically unaffected by test; immersion in water, must be practically unaffected in three hours; ash, not exceeding 0·7 per cent. if the ash contained lead; thinners, 35 to 55 per cent.; gum-resin, not exceeding 40 per cent. on spirit-free varnish; resin, not exceeding 5 per cent. In the case of oak varnishes and general purpose varnishes the results gave the same figures.

For gold size and preparation varnishes, the appearance must be only slightly cloudy; the presence of coal tar distillates was not objectionable in regard to odour; the viscosity was 25–38 per cent.; drying was as follows: Skin dry under one hour; dry, under three hours; and hard dry under eight hours. The film after two days' exposure must be free from brittleness, but the formation of dullness or specks after exposure to weather was of no importance. Ash not to exceed 12 per cent. Pb and Mn on spirit-free varnish; thinners not less than 58 per cent. Gum-resin should ordinarily not exceed 40 per cent. on spirit-free varnish; but as the brittleness was also influenced by ash content when gum-resin was high, a practical exposure test must determine if a tendency to brittleness existed. Resin should preferably be entirely absent.

Tung oil and resin varnishes might have a slight turpidity if it did not affect the glossiness of the film. The viscosity in the case of these varnishes should be from 40 to 60 per cent.; they should dry hard in 24 hours, and must not "web" in atmosphere charged with products of combustion. They must be quite unaffected by weather and immersion. Within reasonable limits, the ash content did not seem materially to affect the properties of the film on exposure. Thinners should be 40 to 55 per cent.; gum-resin should be absent, and resin should not exceed 25 per cent. on spirit-free varnish.

The Paper dealt only with oil varnishes, but it was obvious, the author said, that the methods described were equally applicable to the examination of the medium in enamel. The separation of pigment from many enamels was often a troublesome process, and the author drew attention to the method of effecting separation by means of a mixed solvent consisting of methyl, alcohol, acetone and benzol.

Discussion

The CHAIRMAN, in congratulating the author on the large amount of experimental work which the process described must have involved, said that while he had no doubt that it would give very good results in the hands of the author, he was sceptical whether the same results would be obtained by others. So much depended upon the knack in applying the method. He would like to ask the author whether his results had been obtained with laboratory made varnishes or with varnishes made in the factory on a large scale. Presumably, in working out this scheme, he had started with varnishes of known composition, so that he was able to check his results, and therefore the question of whether the varnishes were made under laboratory or factory conditions was an important one. Then, apparently, this method would apply to straight varnishes, and not to blended ones, of which there were a number on the market, and it appeared to him that, in connection with blended varnishes, there were many points where the process would break down.

Mr. A. E. BAWTREE said the author had not dealt as fully as he would have liked him to with the influence of the mineral matters present in a varnish, which had an enormous influence upon the character of it. There were some pitalls in this connection which, though at first sight they might seem rudimentary, were of considerable importance. If they took a varnish or a liquor extracted from paint which contained a considerable proportion of lead, when that was burned down, in nine cases out of ten there were some little black beads in it, which at first sight might be thought to be simply reduced lead. Fuller investigation, however, showed that they were of quite a complex nature. No doubt they were largely lead, but they also contained a certain proportion of manganese and other metals reduced with the lead, as well as carbon in some very resistant form, probably in the form of graphite. Some method of getting the varnish free from any reduced particles would be very convenient, but so far he had not been successful in getting one.

Mr. R. P. L. BRITTON agreed with the author and the Chairman that the interpretation of the results obtained by such a method as this was of the highest importance. Hitherto there had not been a method put forward which would allow the ordinary analyst to analyse a sample of varnish and to give to anyone who wanted it a sample of such a varnish made up as the result of the analysis. He was sorry that the author did not give some details of an American method of analysis, because he felt there was a very great future before it. He did not agree that the chemical analysis of a varnish would ever supplant the ordinary physical tests, which could be applied in the laboratory for the determination of the value of a varnish for any purpose.

Mr. G. W. DUNSTER asked how the author selected his hard copal or congos, and how he arrived at the correct estimation of these hard resins. He would also like to know how he judged whether linseed oil was fit for varnish making. The same applied to tung oil. There were several things on the market called linseed oil for varnish manufacture, but they often had to be turned down as unfit for that purpose.

Mr. A. D. WALKER, referring to the insolubility of the solid portions of the varnish, said that in certain spirits, probably coal tar spirits, the solid portion seemed to crystallise out. He did not know whether the proportion of sulphur in the spirit had anything to do with it.

Mr. H. L. HOWARD, speaking with regard to viscosity, said it was an important point that there should be one temperature which everybody used. He did not know which was the more usual. He had always used 25 degrees, but that was because the A.I.D. specified it.

Mr. de Waele's Reply

Mr. DE WAELE, replying to the discussion, said that undoubtedly the manipulation of the method was not easy, and it was a question of a good deal of practice. The varnishes he had experimented with were made by a manufacturer whose works he had never seen. He was a reputable manufacturer, and he had preferred that the analysis should be submitted before he gave the composition of the varnish. Therefore they were works made varnishes in every case, and the agreement was sufficiently close for the limits of a specification. He could not say very much as to the value of the method in connection with blended varnishes. It was a somewhat controversial question as to whether by blending two varnishes in equal proportions with gum contents of 20 per cent. and 40 per cent. a varnish would be obtained which would show 30 per cent. of gum on the gum-oil combination. In reply to Mr. Bawtree, a good deal could be written on the subject of ash content, but he regarded it as far too controversial a point to be included in such a Paper as this. The beads mentioned by Mr. Bawtree he had also noticed in the absence of lead, and he thought they could be traced to the presence of an easily fusible salt of the alkaline metals enclosing carbon within it. Mr. Dunster had referred to the identification of the various gums. There were difficulties in doing this, but with a little more work he believed he would be able to identify more of them than he had set out in the Paper. There was one method of getting at the proximate constituents of linseed oil which did not seem to have received the attention which it deserved, and that was the determination of the saturated fatty acids. The question of the evaluation of tung oil had been discussed a good deal in the American press, but his own opinion was that nothing seemed to be so valuable as the refractive index combined with the specific gravity. The viscosity apparatus which he used was simply a U tube of the Ostwald type. The temperature of the determination of viscosity should be regulated really by the temperature at which there was an appreciable loss of volatile matter, and he had mentioned in the Paper that the temperature adopted was 15 degrees. Altogether this work was exceedingly difficult, and the most he hoped for from the Paper was that it would bring forward another in the next session.

At the conclusion of the discussion, Mr. de Waele said it had struck him that, in connection with paint and varnish, there were very few methods of control. There was viscosity, and they were slowly beginning to appreciate that. The question of surface tension had been brought before their notice in the recent Paper by Dr. Morrell, and he thought the impression left upon most of them was that it was a thing to be remembered and gone into; but few of them saw its immediate application. For a long time he had been puzzled by a peculiar property in paints—viz., consistency. What was consistency? It was not identical with viscosity. In a recent Paper before the American Society for Testing Materials, Bingham and Green had gone into this question of consistency as appied to paints, and he did not think he need elaborate the value of the determination of such a question as consistency in regard to works practice. Bingham and Green had laid it down that paints were not liquids of high viscosity, but plastic solids of low mobility, and they found that, with a plastic solid such as paint, it was necessary to apply a definite and characteristic pressure before any movement whatever could be obtained, and that afterwards the systems obeyed the ordinary laws of viscosity, in that the speed was proportional to the pressure applied. It was for these reasons that he suggested that works' chemists should do all they could to develop this question with a view to the determination of an extra physical chemical constant. At the present time, chemical constants were practically nil. He had discussed the question with Prof. Porter, and he similarly was in the dark as to the meaning of consistency.

Death of Sir Charles Allen

A PROMINENT figure has been removed from the Sheffield steel trade by the death on Monday of SIR CHARLES ALLEN, chairman of Henry Bessemer & Co., Ltd. Sir Charles's father, Mr. W. D. Allen, founded the firm of Henry Bessemer & Co., Ltd., and perfected the steel-making process invented by his brother-in-law, Sir Henry Bessemer. Joining the firm as a young man, Sir Charles succeeded his brother, the late Mr. Henry Allen, as chairman some 20 years ago. For many years he was also a director of the Ebbw Vale Coal & Iron Co. and the Carlton Main Colliery Co.

Motor Transport and Motor Fuels

SIR MARCUS SAMUEL, chairman of the Shell Transport & Trading Co., Ltd., in acknowledging the toast of the "Motor Transport and Motor Fuels," at the annual luncheon of the Commercial Motor Users' Association at the Savoy Hotel on Wednesday, said that he believed some solution could be found for the scarcity of motor fuel by its production from other sources, and his firm and others had subscribed £210,000 for the endowment of chemical research at Cambridge University. (Cheers.) This was not to be applied exclusively to petrol problems. Referring to a circular issued by the Automobile Association for the purpose of obtaining signatures to a petition, which he criticised, he said he was willing personally to add £1,000 to this fund if every signatory of the Automobile Association's petition would give a minimum of one shilling, and so prove their sincerity in this matter. His company would very gladly assist in the distribution of any substitute for petrol that might be found, and would do it on any terms the Government considered desirable or fair. It was a gross mis-statement to say that there was a ring or trust in petrol. He could assure them that the British Government, through him, had had the opportunity over and over again of having British control of the Shell group, and they had not taken it; instead they had done a stupid and almost criminal thing, and had thrown in their lot with a single company. Sir Marcus gave the assurance that he would never sell out to the United States.

Some Notes on Barbados Manjak

BARBADOS Manjak is a natural high grade asphaltum found on the Island of Barbados, where the name manjak originated. The product has been equalled only by the once famous Turkish Bitumen, which used to be sold in boxes of 50 lb. weight and fetched an extraordinarily high price on account of its purity, black colour, and elasticity. When Barbados began to ship its high-grade manjak to the United States in 1895 the name had never been used in any other market, but it was adopted by the sister colony of Trinidad, with which product Barbados manjak should not be confused. When it was first put upon the American market, manjak was called "Glance Pitch," the original name for "Gilsonite" (the Utah-Colorado product), which in turn was copied by Mexico, Cuba, and other asphalt producing countries.

Barbados manjak is produced in three grades, "C brilliant," "A," and "E," and these have long held a unique position on the New York market, as it was found that no other native asphaltum could compete with them in the manufacture of high-grade insulation varnish and japan enamels, where intensity of colour, lustre, elasticity, melting point and strength are of primary importance. These points allow of considerably more thinning medium, or fluxes being used. The lower melting point of "C brilliant" renders it suitable for certain work in which the solvents and other ingredients used could not stand a very high heat, and for which high melting points are unsuitable. The other grades, "A" quality and "E" quality, which are produced from another mine on the island, possess higher melting points and are thus fitted for work requiring high temperatures.

Prior to 1905, shipments of "C" brilliant were made to England, but two years before this the product was withdrawn from British and European markets owing to American competition having forced up the price beyond what British manufacturers would pay; in fact, at that time New York dealers were prepared to pay £30 per ton for the whole output or fully £10 per ton more than English buyers would then pay. When this price was ruling in New York for "C brilliant" the native American "Gilsenite" was retailing at £9 10s. to £11 10s. per ton.

Some few years ago Egyptian asphaltum found a market in England, and when imported was covered with a coat of dust or clay and mixed with stones, gravel, &c., but this asphaltum was considered to have some very good properties, and was recommended for high class work. An analysis by Holm gives the following for Barbados manjak:—

Carbon	Hydrogen.	Sulphur.	Ash.	Density.	Melting Point.
87·4	9·56	2·67	0·24	1·040	110°C.

IMPERIAL INSTITUTE ANALYSIS.

	Asphaltene.	Petrolene.	Organic Non-Bit. Matter.	Ash.
"C" Manjak ...	79·69	20·21	0·00	0·08
"A" Manjak ...	68·00	29·21	0·64	0·97

The following is taken from the "Mineral Industry," 1908, an annual New York Publication:—

	H_2O	Ash.	C.	Sp. Gr.
"Gilsenite"	1·00	4·5	59·00	1·145
"A" Manjak ...	2·49	2·7	83·62	1·098

H. Abraham, in "Asphalt and Allied Substances" (Crosby Lockwood, 1918, pp. 134, 135), states that Barbados manjak contains a very small percentage of sulphur (between 0·7 and 0·9 per cent.), and about 1 to 2 per cent. of mineral matter, and that the percentage of fixed carbon varies between 25 and 30 per cent. The same author refers to the material as being used largely for the manufacture of varnishes and japans, on account of its high purity, gloss, and intense black colour.

Some years ago Messrs. Pearce & Beardsley, of California, took out a patent for the manufacture of manjak paint by the use of carbon bisulphide, and this paint which was called "P and B" paint, became very popular. Mr. A. H. Sabin, M.S., who was consulting chemist to Messrs. E. Smith & Co., and lecturer in New York University and the Massachusetts Institute of Technology, in his work on the "Technology of Paint and Varnish," writes:—"Bisulphide of Carbon is a volatile liquid which has the property of thinning maltha very rapidly, so that a small quantity of it produces as great an effect in making the compound fluid, as several times as much spirit of turpentine would have. Hence a varnish can be made in this way which is almost all solid matter, and a much thicker layer can be applied than of any other material."

On the subject of "Permanently Elastic Asphaltum Varnish," Mr. Sabin writes:—"What is commonly sold as asphalt varnish is a solution of asphalt in turpentine or benzine, mixed with a varying amount of quick drying varnish, usually resin varnish, but asphalt varnishes differ greatly in price." On the use of hard asphalt such as Barbados manjak, Mr. Sabin states that these should be mixed with hard varnish resins (to assist the drying) and linseed oil, when they will give "fine lustre and extraordinary durability," and he further adds that if the mineral oil of soft asphalt (known to the trade as maltha) is excluded, and only linseed oil used, the result is "permanent, and a film of such varnish retains its elasticity as well as one made from oil and the best varnish gums. If we start with gilsonite, we find it necessary to add to it something to make it cohere and elastic."

Mr. Sabin suggests acetate of amyl as the correct solvent for pyroxylin varnish for patent leather dressing and high class enamels of great elasticity and permanence. Barbados manjak, by virtue of its elasticity, impermeability, and general insolubility when dried, will impart resistance, durability and intense black lustre. The more care taken in the boiling of manjak in oil and varnish resin, the better will the varnish dry. In ordinary varnishes the brilliancy and lustre depend upon the nature of the resin, and the index of refraction of resin being greater than that of linseed oil, the larger the percentage of resin the greater the lustre. But varnishes made from Barbados manjak do not require much resin, as the lustre after melting is even stronger than the natural state of that asphaltum. The harder the asphaltum the greater the lustre.

An Effective Substitute

IN these days of high prices for commodities which were at one time so cheap and plentiful, "substitutes" are being freely advocated and used, some with great success. As an example may be mentioned tartaric acid, citric acid and cream of tartar. These three articles are always in great demand for domestic and technical uses, and it is difficult to find an efficient substitute. However, a special preparation, technically called acid sodium phosphate, is now filling the gap caused by the dearness and short supplies of this important group of acid bodies. For many purposes where acidity only is required acid sodium phosphate can effectively take the place of these acid bodies. Acid sodium phosphate is a pure white crystalline preparation, entirely soluble in water, possessing a greater acidity than cream of tartar, and is generally guaranteed to be in conformity with the Foods and Drugs Act. Its cost to-day is considerably less than prices asked for the three other acids whose place it effectively takes.

The Institute of Metals

THE position of students whose course of studies was interrupted by the war, or by special circumstances arising from the war, has been sympathetically considered by the Council of the Institute of Metals. It has been decided to recommend for ballot as student members of the Institute candidates for election who, whilst being students of metallurgy, have passed the age limit of 25 years for admission to student membership. Students so elected may remain in the category of student members up to June 30, 1923, so long as they continue to be students of a recognised school of metallurgy. This concession represents an appreciable financial saving, as a student member pays only the guinea entrance fee and guinea subscription of pre-war days. By a further concession, members and students elected at the forthcoming ballot on May 31 will not only have the privilege of membership for 13 months instead of the usual 12, but will receive an extra copy of the *Journal of the Institute of Metals*, of which copies to the value of over £1,000 have been sold to non-members during the past 12 months.

The Faraday Society

At the last meeting of the Faraday Society the president, Sir Robert Hadfield, made public for the first time the important part the Society had taken in 1916 and 1917 in the initiation of the movement which led to the formation of the Nitrogen Products Committee of the Munitions Inventions Department, the monumental report of which was recently published. The occasion of the announcement was the receipt of a letter of thanks from Sir Graham Greene, Secretary of the Ministry of Munitions, acknowledging the help rendered by the Society and many of its members. The letter states that arrangements are now on the point of being concluded whereby the synthetic ammonia factory which had been partially erected is to be transformed into a commercial project on a very large scale, and many other fixation schemes are under consideration throughout the Empire. It concludes that the Faraday Society will doubtless consider the objects it had in view, in bringing the nitrogen problem before the Ministry, have been in a great measure achieved.

American Chemical Notes

Leather Chemistry Section

Philadelphia chemists were largely instrumental in securing a favourable decision on the part of the officers of the American Chemical Society for the formation of a Leather Chemistry Section. This section held its first meeting at the spring meeting of the American Chemical Society in St. Louis this week. Dr. William Klaber, of Philadelphia, has been appointed secretary of the section; the chairman is Dr. Louis Levey of Milwaukee. The purposes of the Leather Section are in no way antagonistic to those of the American Leather Chemists' Association; the latter is primarily a society of leather analysts, while the new section will be formed to specialise in the theory of leather formation.

Photo-sensitising Dyes

THE United States Bureau of Chemistry announces that the work on photosensitising dyes begun during the war for the Bureau of Aircraft Production has met with such success as to make possible the preparation in the United States of dyes of all the recognised types: Pinaverdol (including Orthochrome T), cyanine, pinacyanol and dicyanine; and of a new type useful for astrophotographic work. The Colour Laboratory of the Bureau will place its experience at the disposal of any manufacturer who wishes to prepare these important photographic aids for the American market; and pending their commercial availability is prepared to supply them to users at a price fixed by the Secretary of Agriculture.

How Chemists Are Organising

SOME prominence is given in *Chemical and Metallurgical Engineering* to an article contributed by the editor of THE CHEMICAL AGE (London) on the question "How British Chemists are Organising," for the same problems confronting British chemists will probably presently arise in the United States. "It should be understood," the writer says, "that the English chemists demand for improved conditions is no piece of mere trade union tactics. The feeling is common to the university chair and to the smallest works laboratory. It is based on the conviction that the science of chemistry and all who practise it deserve fuller and more generous recognition all round."

American Orders for German Potash

It is announced in German newspapers that American orders for potash amount to $50,000,000. Production by plants controlled by the syndicate is improving as a result of increased coal deliveries and betterment in transportation, and home demands for agricultural purposes have been arranged for. The syndicate, therefore, hopes to be able to devote the greater part of its output to the American export trade. As payment for potash shipped to America will be made in dollars it is believed by the Government that the syndicate's deal will assist materially in the meeting of German obligations abroad.

The Potash Syndicate, in reply to German newspaper reports, denies having booked American orders to the amount of £50,000,000, as reported recently by the *Vossische Zeitung*. It says that while deliveries to the United States are steadily increasing since they were regularly resumed last October, no definite contracts have been entered into. The syndicate has been in consultation with the American buyers for some weeks past, but owing to the state of exchange, transportation difficulties and handicaps growing out of labour conditions, it has been unable to assume obligations involving the deliveries of specific amounts. The proposition to accept American coal in return for potash is looked upon as unfeasible, not only because based upon rates that make the price of American fuel prohibitive, but also because of the technical equipment of the German plants, where the kilns are adapted only to the use of lignite.

An Opinion on British-German Trade

Mr. Robert H. de Greeff, of R. W. Greeff & Co., who has recently returned to the United States from a business tour of Europe, has given an interesting statement of his impressions to the American press. English chemical consumers, he states, would just as soon buy supplies in Germany as in the United States or elsewhere, if there were so much as a quarter or a tenth of a cent. difference in price, so far has England placed the war behind her and returned to the normal order of things. Although England would purchase German chemicals and dyes if she could, representatives of various English houses who have made trips into Germany with the idea of locating supplies of these products have been unsuccessful in their attempts and have reported back that Germany has no stocks. As far as feeling against German goods in the commercial life of England is concerned, Mr. de Greeff reports that it has practically disappeared. Commerce has almost completely eradicated most of the sentiment engendered by the war.

Although most of the English chemical plants are running at full capacity, the 30 per cent. reduction in coal production has handicapped them greatly. As far as labour conditions are concerned, Mr. de Greeff said that England appeared to be having less trouble than the United States, owing undoubtedly to the absence of a large foreign element. The exchange question is causing considerable worry to English authorities, and they are doing their utmost in cutting down the importation of unessentials to help the pound sterling to recover a position nearer par.

In discussing the condition of Europe in general, Mr. de Greeff said that Germany was unquestionably in a very bad condition economically and that the opinion appeared to be quite widely expressed in England and on the Continent that Germany would never fulfill the obligations of the Peace Treaty in full.

Catalysts for Ammonia Oxidation

In a Paper read at the recent Philadelphia meeting of the American Chemical Society, Professor G. A. Perley dealt with the subject of catalysts for the oxidation of ammonia. His summary of the factors affecting the design of ammonia oxidation apparatus was as follows:

1. There are as many different commercial ammonia oxidation platinum catalyst installations as there are possible types.

2. The use of a suitably preheated air-ammonia mixture is pointed out as most important for the production of a sufficiently high temperature for a rapid reaction velocity of the desired reaction.

3. The use of a platinum gauze of 0·0025 in. diameter wire and 120 to 150 mesh is far more logical than one of 80 mesh, since it decreases the free gas space between the wires.

4. A three-layer platinum gauze arrangement represents probably the maximum upper limit of gauzes, if the economical use of platinum is considered. A mantle form of catalyst is desirable.

5. The gauze layers should be separated a sufficient distance in order to permit the much diluted ammonia-air mixture, which passes the first layer, to become raised to a higher temperature than the original more concentrated ammonia mixture. An increased reaction velocity may thus be obtained. A coarse-meshed platinum separator has been suggested as a means of maintaining uniformity of gas space and equality of temperature in the various layers. The temperature of the last layer will always tend to be much lower than the others unless a heat-conducting separator is utilised.

6. It is quite probable that NO is not the initial product formed in the ammonia oxidation reaction. If such is the case, the use of separated gauze layers will depend upon a careful application of space-time-temperature-oxygen factors.

7. The troublesome factors involved in the theoretical decomposition reactions when using separated gauze layers can be made to vanish by a proper control of the space-time-temperature factors.

Compendia of Physical Constants

At the annual meeting of the American Institute of Chemical Engineers proposals were unanimously endorsed for the publication of Critical Compendia of Physical Constants, emphasising particularly the necessity of raising between $100,000 and $200,000 for financing the undertaking. The formal resolution adopted sets out that every industry, for its successful operation, depends upon an accurate knowledge of the properties of the materials it uses and produces, and the numerical values of these properties, which are known as their constants. During the war it became evident that much of the published data on these constants was extremely inaccurate, entailing considerable loss in time and money, and it was found in many cases that data very much desired was not to be found in published records. Up to now publication of such constants in tabular form has been mostly in some foreign language, and consequently of limited availability. Under allotment by the Inter-allied Council and the International Research Council, the National Research Council of the United States (an organisation duly created by act of Congress), has decided that this deficiency could best be met by the compilation and publication in English of tables of constants which have been critically reviewed as to their accuracy, and has decided that this could best be done by the appointment of a committee to act as trustees in charge of such compilations, and as far as is necessary to have charge of the determination of such constants as have not already been published or determined. The trustees so appointed were selected as representing the American Chemical Society, the American Physical Society, and the American Institute of Chemical Engineers, the representatives being, respectively, Julius Steiglitz, Edwin P. Hyde and Hugh K. Moore. The American Institute of Chemical Engineers in convention assembled heartily endorses this project.

From Week to Week

Plans have been passed for extensions, estimated at £1,000, to be carried out at WALKER'S CHEMICAL WORKS, Irvine.

We regret to hear that Dr. R. MESSEL, F.R.S., foreign secretary of the Society of Chemical Industry, is lying seriously ill at his London residence.

A message from Brussels states that on Tuesday an EXPLOSION OCCURRED in a chemical factory near Aix-la-Chapelle. The number of victims is estimated at 200.

Mr. C. L. CLAREMONT has been appointed by the Ministry of Agriculture and Fisheries chemist for research work in connection with the Rats and Mice (Destruction) Act, 1919.

With reference to a letter which appeared in the *Daily Express* on Monday, the directors of ANGLO-AMERICAN OIL state that the company is taking no steps to limit supplies of petrol to the country.

The SCOTTISH SHALE OIL SCIENTIFIC AND INDUSTRIAL RESEARCH ASSOCIATION has been registered as a new company. Communications should be addressed to Mr. W. Fraser, Scottish Oils, Ltd., 135, Buchanan Street, Glasgow.

Damage estimated at £80,000 was caused by a fire which broke out on Tuesday at the oilcake factory of ALEXANDER CROSS, LTD., Glasgow. The factory, which had recently been fitted with new machinery, was completely burnt out.

MR. J. A. REAVELL, managing director of the Kestner Evaporator & Engineering Co., Ltd., of London, has been elected chairman of the Chemical Engineering Group of the Society of Chemical Industry for the coming year.

EXPERIMENTS IN COLOURING GLASS by the hot mineral waters of Bath have been successful, and facilities are being given for the colouring of glass souvenir articles, to be placed on sale at the Pump Room, the Corporation taking half profits.

By a unanimous vote of the Chemical Industrial Council AN ADVANCE TO CHEMICAL WORKERS of 6s. per week, plus 12½ per cent., has been conceded, half payable from April 1 and the remainder from June 1. In lieu of retrospective pay gratuities of 10s. and 13s. are made to labourers and shiftmen.

The three-quarter million company, to be known as WEBB'S CRYSTAL GLASS COMPANY, formed to acquire the business of Messrs. T. Webb, of Stourbridge, the Edinburgh Glass Company, and the Lamp Blown Glassware & Accessories Company, will form part of the organisation of British Glass Industries, Ltd.

A forthcoming addition to Sir Edward Thorpe's series of MONOGRAPHS ON INDUSTRIAL CHEMISTRY will treat of "The Manufacture of Sugar from the Cane and Beet." It will be by T. H. P. Heriot, of the Royal Technical College, Glasgow, and give special attention to the principles underlying factory operations.

THE CHEMICAL AGE OF NEW YORK announces that in future it will be published once a month instead of fortnightly. The February issue, with which this arrangement begins, has been delayed by the conditions in the printing trade, due to the eight weeks' strike, but it is hoped that the April number, which is due on April 15, will be out to time. The subscription price has been reduced to $3 a year, and the subscriptions of those who have paid $5 will be extended to cover the excess payment.

The plentiful supply of roots and grass, due to the abnormal season, is said to be the chief reason for the welcome fall in the PRICE OF FEEDING STUFFS generally. It is stated that cocoanut cake has lost half of its value in the past four months, and the same applies to palm-kernel meal and cake. The drop in cotton cake has during the same period amounted to more than a third. In the numerous by-products, in the form of cakes and meals, the decline has been in the same proportion.

A sudden outbreak of 60 cases of ARSENICAL POISONING AT HASLEMERE, Surrey, has been traced to a barrel of moist sugar, which had become contaminated with a liquid preparation of some kind largely composed of arsenic. Most of the cases were slight, and on Tuesday it was stated that all the victims were out of danger. This occurrence has drawn attention once more to the dangers that may arise from foodstuffs and poisons being conveyed together on the railways, and we understand that the Ministry of Health is again moving in the matter.

In the first of a series of three lectures on "ALUMINIUM AND ITS ALLOYS," at the Royal Society of Arts, Mr. Walter Rosenhain, superintendent of the Metallurgy Department, National Physical Laboratory, said that aluminium could compete successfully in the market for engineering and similar purposes only when a process had been discovered which would provide for its comparatively cheap manufacture. At a moderate estimate the price would need to be about three times cheaper than steel before aluminium could compete successfully with that metal.

The serious position of the CORNISH TIN-MINING INDUSTRY was referred to at the half-yearly meeting of the Bolcoath Mine, held in London last week. The report showed a loss of £18,063 for the half-year ending December 31 last, in addition to a loss of £19,509 during the first half of 1919. Mr. Oliver Wethered, vice-chairman, said the industry was in a precarious position, and they were hoping that the Non-Ferrous Mining Trades Committee appointed by the Government would grasp the fact that the tin-mining industry was well worth preserving in England, and that the Government themselves were very largely to blame for the trouble that had taken place in Cornwall. He thought they had a strong case for Government help.

SIR RICHARD REDMAYNE (chairman of the governors of the Imperial Mineral Resources Bureau), in proposing "The Institution and the Mineral Industries" at the annual dinner of the Institution of Mining and Metallurgy, held at the Connaught Rooms, London, on Friday, April 9, emphasised the immense services which members of the institution rendered to the Empire during the war, not only in the ranks, but in the different Government departments. But important as had been the work of the institution in the past, he took the view that its work in the future would be still more important. Referring to the Imperial Mineral Resources Bureau, Sir Richard explained that it was intended to serve as a clearing house of general information for the Empire in regard to mining matters, and it was also hoped that it would be an inspiration for bringing together the producer and the consumer.

Sir Beville Stanier, M.P., chairman of HOME-GROWN SUGAR, LIMITED, announces that arrangements have now been completed for the erection of the beet sugar factory on the Kelham Estate, Newark. The contract for the plant and machinery has been placed with a firm of French beet sugar machinery experts, the Compagnie de Fives Lille, of Lille and Givore. Certain parts of the plant will be manufactured by British engineering firms on behalf of this company. The factory buildings, wharf, railway sidings, silos, &c., will be according to plans and expert layout of the site prepared by the Compagnie de Fives Lille, and erected by Messrs. Walter Scott & Middleton, Ltd., building and railway contractors, under the supervision of Messrs. Hal Williams & Co., who have been appointed consulting engineers for the constructional work. Labour is being assembled and material collected, and building will begin this month, with a view to the factory's being ready for working in the autumn of 1921.

In consequence of the scarcity and high price of petrol it is announced that the Government have decided to undertake an important series of experiments with a view to discover an efficient substitute. Extensive new laboratories are being provided for the Government Chemist, Sir JAMES DOBBIE, with a special staff of assistants. Experiments in extracting power alcohol from a number of vegetable substances have been made, and it is already clear that power alcohol can be produced from these more cheaply than the present selling price of petrol. One great difficulty remains to be overcome and it is to the solution of this that the Government experts are devoting their attention. Nothing has yet been found which will make power alcohol impossible for human consumption. If it were taxed on this basis it would be too dear for use as a propellant, and if it were issued untaxed there would obviously be an enormous loss to the national revenue because it would be used instead of tax-paying drinks. In case the Government chemists are unable to discover means for making power alcohol impossible as a beverage the Board of Inland Revenue has been asked to try to devise a scheme for overcoming the taxation difficulty.

References to Current Literature

Only articles of general as distinct from specialised interest are included and given in alphabetical order under each geographical subdivision. By publishing this digest within two or three days of publication or receipt we hope to save our readers time and trouble; in return we invite their suggestions and criticisms. The original journals may be consulted at the Patent Office or Chemical Society's libraries. A list of journals and standard abbreviations used appeared in our issue of December 27 last.

British

COAL. Determining moisture in coals, &c. A. R. Myhill. *Gas J.*, April 6, 21. A rapid and accurate method is described.

COMBUSTION. Combustion of complex gaseous mixtures. W. Payman. *Gas J.*, April 6, 19-21. A résumé of the author's recent work on the subject.

ELEMENTS. The inter-relationship of the chemical elements. H. Collins. *Chem. News*, April 9, 169-170.

GAS. Diminution of waste heat losses in water gas operation. H. L. Nicholson. *Gas J.*, April 13, 85-86. A Paper read before the New England Association of Gas Engineers.

PEAT. Peat. *Engineering*, April 9, 484-485. An editorial, dealing with the subject principally from the power aspect.

French

ANALYSIS. Rapid determination of carbon. L. Lescœur. *J. Pharm. Chim.*, April 1, 257-263. The method depends on oxidation with sodium nitrate.

The "chloride method" in water analysis. F. Malméjac. *J. Pharm. Chim.*, April 1, 263-268. A method of examining waters based principally on a determination of chlorides.

SOLVENTS. Chlorine derivatives of acetylene and their uses. R. Fabre. *J. Pharm. Chim.*, April 1, 268-278. A useful account of the preparation and properties of these compounds.

ZINC. Study of the reactions of the metallurgy of zinc. M. Lemarchands. *Comptes. rend.*, March 29, 805-807. The reactions of zinc oxide with carbon and carbon monoxide have been studied.

United States

ALUMINIUM. Aluminium rolling mill practice. R. J. Anderson and M. B. Anderson. *Chem. & Met. Eng.*, March 31, 599-604. This instalment contains specifications for aluminium sheet, particulars of ingot heating furnaces, &c. (See also CHEMICAL AGE, 1920, 383.)

ANALYSIS. Arc images in chemical analysis. W. R. Mot. Amer. Electrochem. Soc., April 10 (advance copy), 40 pp. The use of the magnified arc image in analysis is described.

Carbon in iron. T. D. Yensen. Amer. Electrochem. Soc., April 10 (advance copy), 16 pp. A modified method of determining carbon is described.

Carbon determination in ferro-alloys. C. J. Rottmann. Amer. Electrochem. Soc., April 10 (advance copy), 10 pp.

BLAST FURNACES. Solving blast furnace flue dust problems. R. W. H. Atcherson. *Bl. Fur. and Steel Plant*, March, 193-197. The factors influencing dust formation are considered and suggestions made for modifying the design of blast furnaces.

BOILERS. Practical notes on waste heat boilers. D. S. Jacobus and A. D. Pratt. *Bl. Fur. and Steel Plant*, March, 205-208.

BRASS. The evolution of the electric brass furnace. H. M. St. John. Amer. Electrochem. Soc., April 10 (advance copy), 15 pp.

BRONZE. Bronze plating. F. C. Mathers and S. Sowder. Amer. Electrochem. Soc., April 10 (advance copy), 4 pp.

CALCIUM. Electrolytic production of calcium. P. H. Brace. Amer. Electrochem. Soc., April 10 (advance copy), 14 pp. An account of experiments carried out at the Westinghouse works.

CARBONISATION. Low temperature carbonisation of coal. S. W. Parr and T. E. Laying. *Bl. Fur. and Steel Plant*, March, 220. Comparative tests on several different coals are recorded.

CATALYSIS. Contact catalysis. W. D. Bancroft. Amer. Electrochem. Soc., April 10 (advance copy), 32 pp. Modern theories on the subject are discussed.

CHROMIUM. Electrolytic chromium. G. J. Sargent. Amer. Electrochem. Soc., April 10 (advance copy), 18 pp. An account of interesting experimental work.

FUEL. Pulverised lignite fuel in California. R. N. Buell. *Chem. and Met. Eng.*, March 31, 605-607. An account of power plant recently erected for utilising lignite.

IRON. Influence of enclosed slag on the corrosion of wrought iron. L. T. Richardson. Amer. Electrochem. Soc., April 10 (advance copy), 6 pp.

The manufacture of ferro alloys in the electric furnace. C. B. Gibson. Amer. Electrochem. Soc., April 10 (advance copy), 9 pp.

Recent developments in the ferro alloy industry. R. J. Anderson. Amer. Electrochem. Soc., April 10 (advance copy), 30 pp.

Crystallography of alpha and beta iron. F. Giolitti. *Chem. and Met. Eng.*, March 31, 585-589. An account of the microscopic appearances of hypo-entectoid steels.

METALLURGY. Reduction of manganiferous silicate slags. E. F. Kern. Amer. Electrochem. Soc., April 10 (advance copy), 12 pp.

REFRACTORIES. Blast furnace and hot stove refractories. R. M. Howe. *Bl. Fur. and Steel Plant*, March, 187-192.

SILICA. Commercial development of fused silica. J. Scharl and W. Savage. *Chem. and Met. Eng.*, March 31, 593-595. An interesting illustrated article.

WATER. Notes on boiler feed water treatment. T. G. Estep. *Bl. Fur. and Steel Plant*, March, 211-214.

German

ANALYSIS. Quantitative estimation of mercury in organic compounds. A. Wöber. *Z. angew. Chem.*, March 16, 63-64.

ASPHALT. Synthetic asphalt limestones, with special reference to Zimmer's process. Krölnke. *Chem. Zeit.*, April 1, 253-255.

EXPLOSIVES. Tabular review of the patents which have appeared during the war in connection with explosives. *Z. ges. Schiess-u. Sprengstoffw*, No. 6, 76-79. Concluding instalment of review previously noted (CHEMICAL AGE, 1920, 284, 309).

GAS. Economics of gas producer practice with recovery of tar and ammonium sulphate. E. Roser. *Stahl u. Eisen*, March 11, 349-357.

MIXING. Graphic mixing calculations. W. Ostwald. *Chem. Zeit.*, March 27, 241-242. Graphic methods for calculating the proportions of constituents to give desired mixtures are described.

POTASH. The development of the potash deposits of Upper Alsace. E. Kohl. *Gluchauf*, March 20, 232-236. Conclusion of Paper already noted (CHEMICAL AGE, 1920, 359).

SULPHURIC ACID. Rapid decolorisation of concentrated sulphuric acid coloured by nitrogen oxides. K. Rosenstand-Wöldike. *Chem. Zeit.*, April 1, 255.

VARNISHES. Review of the progress of raw materials, adjuncts and substitutes used in the manufacture of varnishes and lacquers, and of progress in making varnishes, &c., in 1919. Utz. *Farben Zeit.*, March 13 and 20, 1036-1037, 1084-1085. These instalments deal with oils.

WATER. Progress in the purification of boiler feed water. D. B. Preu. *Z. angew. Chem.*, March 16 and 26, 61-63, 70-72. A general account of modern processes.

Miscellaneous

CHARCOAL. The absorptive powers of different kinds of charcoal. K. Scheringa. *Pharm. Weekblad*, March 27, 348-350.

COLLOIDS. Modern developments in colloid chemistry. G. Weissenberger. *Oesterr. Chem. Zeit.*, March 15, 37-40.

PLATINUM SUBSTITUTES. J. C. de Rinjter de Wildt and C. A. Koppejan. *Chem. Weehblad*, April 3, 174-175. Experiments with an alloy of gold and are described.

Patent Literature

We publish each week a list of selected complete specifications accepted as and when they are actually printed and on sale. In addition, we give abstracts within a week of the specifications being obtainable. Readers can thus decide what specifications are of sufficient interest to warrant purchase, the only way of obtaining complete information. A list of International Convention specifications open to inspection before acceptance is added, and abstracts are given as soon as possible.

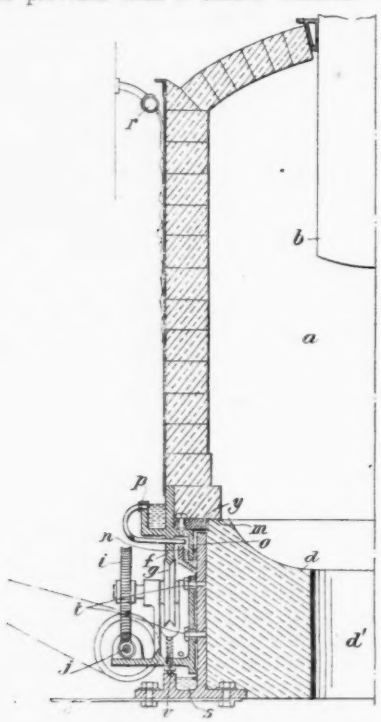
Abstracts of Complete Specifications

124,220. OILS AND FATS, PROCESSES FOR RECOVERING—FROM SOAP-FREE WASTE WATER. Naamlooze Vennootschap: Anton Jurgens' Vereenigde Fabrieken, Oss, Holland. International Convention date (Holland), March 9, 1918.

The process is for the recovery of oils or fats from water in which they are present in small amount as emulsions. It is found that the emulsion can be "broken" by adding to it a very small proportion of an electrolyte, such as common salt, alum, hydrochloric acid or sulphuric acid. The electrolyte added should be about 0·01 to 0·02 per cent. of the waste water. The oil may then be separated by passing it through an ordinary fat separator.

139,843. ELECTRIC FURNACES. E. Fenton, King Edward Foundry, Loughborough, Leicestershire. Application date, June 21, 1919.

The furnace is of the vertical circular type used for graphitising and calcining purposes. The upper rotary part of the furnace *a* is provided with a central electrode *b* normally



139,843

dipping into the material under treatment, and the lower fixed part is provided with an annular electrode *d* to which current is supplied by the conductor *e*, and which has a central outlet *d'*. An annular flange rail *f* is attached to the part *a* and is supported on rollers *g* preferably of V-section; one or more of the rollers is driven by means of a worm wheel *i* driven by a worm *j* which is attached to the power shaft. Air or gas is prevented from entering or leaving the retort by means of a water seal formed by a depending ring *o* dipping into a trough *n*. The furnace is cooled by means of jets of water sprayed on to its outer wall by pipes *r*, and the water flows down into the trough *p* and thence into the water seal *n*. The water finally flows down over the base of the furnace to cool it and is conveyed away by the trough *s*. The clearance space *m* may be adjusted by levelling screws *v* and the base of the furnace is then secured by bolts *t*. Detachable segmental plates *y* are provided to ensure a uniform lateral clearance.

139,880. ABSORPTION TOWERS, DSTILLATION COLUMNS OR THE LIKE, RINGS FOR FILLING. R. Lessing, Southampton House, 317, High Holborn, London. Application date, February 27, 1919.

Absorption towers and the like in which a large surface is required are filled with small metal rings having a diameter equal to their height. The rings are bent from a single piece of metal and each is provided with a partition extending partly across a diameter and formed by bending one of the ends of the strip of metal inwards. The ring is easily made and offers an increased surface.

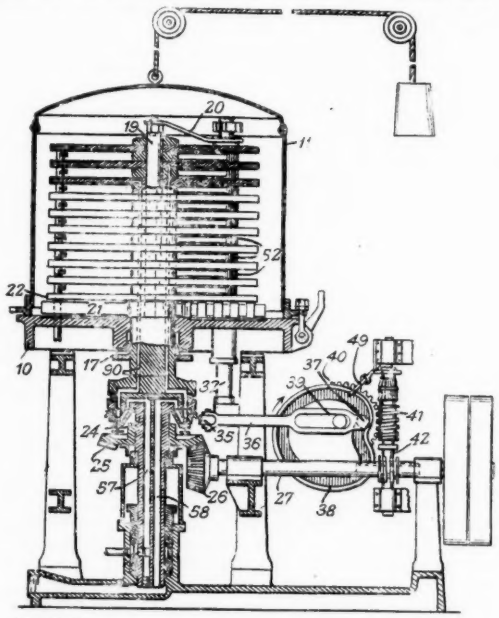
139,981. CARBAZOLE, MANUFACTURE OR ISOLATION OF. Burt, Boulton & Haywood, Ltd., Salisbury House, London Wall, London, E.C.2, and F. D. Miles, Prince Regent's Wharf, London, E. Application date, June 19, 1919.

The process is for isolating carbazole from mixtures containing it, such as tar distillates or the residue of such distillates after the removal of anthracene and other hydrocarbons. As an example, 85 parts of potash containing 80 per cent. of potassium hydroxide and 20 per cent. of water are melted, 180 parts of naphthalene and 180 parts of crude carbazole are added and the mixture is heated until the carbazole is dissolved in the naphthalene. Naphthalene and water are finally distilled off and the napthalene is condensed and recovered. 360 parts of heavy coal tar naphtha are then added, the mixture is raised to boiling point and then filtered, when the solid potassium carbazole is retained and the impurities remain in the liquid. The solid potassium carbazole is decomposed by boiling with water and the resulting carbazole is filtered off and freed from potash by washing. By this process the alkali metal carbazole is produced at a temperature below its melting point and its decomposition is avoided. The potassium hydroxide may be replaced by caustic soda or by sodium, or by an alkali metal oxide. The potash, &c., and the naphthalene are recovered.

139,991. FILTERING LIQUIDS, DEVICES FOR. F. K Atkins and E. F. Atkins, Hamilton St. and Franklin Avenue, Harrison, N.J., U.S.A. Application date, July 8, 1919.

The filter is of the pressure type in which scraping or cutting devices operate between the filter plates to remove the filter cake. The filter is contained within a cover 11 mounted on a fixed support 10 through which a vertical shaft 17 passes. A concentric shaft 19 passes through the shaft 17 and is connected at its upper end by a bar 20 to the upper end of a shaft 32. The shaft 19 carries a cutter head 21 and a series of filter plates 22 and spacing washers 23. The shaft 17 is attached to a shaft 24 having a bevel wheel 25 meshing with a bevel wheel 26 on a shaft 27. The shaft 32 is provided with bearings at its two ends and is connected by a crank 35 at its lower end to a connecting rod 36, having a cam roller 37 engaging with a cam 38. The cam is mounted on a shaft 39, having a worm wheel 40 engaging with a worm 41 loosely mounted on a shaft 42, but capable of being clutched to it by operating a handle 49. The shaft 32 carries a series of cutters 52 similar to a lathe tool, which project between the filter plates 22. The plates 22 are of the type in which a filter cloth covers a cellular structure, each plate being provided with an outlet conduit 90 which passes downwards through the shaft 17 to a pair of discharge conduits 57 and 58. The cutter head 21 carries a set of cutters which cover the whole area of the filter cloth on the base 10. The unfiltered liquid is passed under pressure into the cover 11 and then through the filter cloths into the conduits 90, the filter plates being stationary and the cutters

52 being withdrawn outside the periphery of the filter plates. Filtration is continued until the space between the plates is filled with filter cake, which may then be washed by admitting fluid through the conduits 57, or 58 and 90 into each alternate filter plate, and thence through the opposite plates to the corresponding outlets. To bring the cutters into operation the shaft 27 is rotated, thus rotating vertical shaft and filter



139,991

plates, and at the same time turning the shaft 32 to swing the cutters 52 into the spaces between the plates. The solid material removed falls into a receptacle at the bottom. The filter cloths may then be cleaned by admitting compressed air into the filter plate to raise the rotating filter cloths from their supports into contact with the cutter edges. The cutters 52 are moved radially inwards by operating the handle 49 to bring the worm gear 40, 41 into operation, so that the cam 38 operates the connecting rod 36 and crank 35 to turn the shaft 32. When the radial movement of the cutters 52 is terminated, the pin 51' trips the handle 49 and de-clutches the worm gear from the driving shaft. Another modification of the invention is also described in detail.

140,001. CATALYTIC HEATING APPARATUS. Société Lyonnaise des Réchauds Catalytiques, Camell, Cochet, Gritte, et Cie., 2bis, Route des Soldats, Lyons, France. International Convention date (France), April 24, 1919.

The apparatus is of the type in which preliminary heating of a catalytic mass is necessary to start its action. A catalytic mass comprising a layer of tangled fibrous material is placed in a container where it is exposed to a stream of combustible gas. A pellet of spongy platinum is placed in contact with the mass just above a tubular asbestos wick which extends downwards to a layer of absorbent material which may be saturated with alcohol. The spongy platinum becomes heated by surface combustion of the alcohol vapour and thus heats the catalytic material sufficiently to start its action.

140,007. SULPHONATION AND CHLORINATION OF AROMATIC SUBSTANCES. H. N. Morris & Co., Ltd., and H. N. Morris, Norfolk Street, Manchester. Application date, June 5, 1918.

The process is for the sulphonation and chlorination of aromatic substances, such as benzol, toluol or phenol, employed in the manufacture of intermediate products for dyes, and the apparatus described and illustrated in connection with No. 139,234 (*see* THE CHEMICAL AGE, Vol. II., page 360) is used. The sulphonation is effected by mixing the atomised aromatic substance with atomised sulphuric acid by spraying both substances into suitable chambers. The mixture is then passed through one or more chambers which are maintained at the necessary temperature for the reaction. When chlorination is to be effected, atomised liquid chlorine is substituted for the sulphuric acid and the chamber into which the mixture is passed contains a catalytic agent. As an example, benzol monosulphonic acid is made from benzol and an excess of sulphuric acid of 30 per cent. above the theoretical quantity required. The temperature of the mixture is maintained below 50°C. by a cooling coil to prevent the formation of disulphonic acid. In the manufacture of chlor-benzol the temperature is maintained at about 30°C. and a catalytic material, such as pieces of wrought-iron or earthenware coated with iodine or aluminium chloride or ferric chloride, is used.

140,011. CATALYSING MATERIAL. The British Thomson-Houston Co., Ltd., 83, Cannon Street, London, E.C. (From the General Electric Co., Schenectady, N.Y., U.S.A.). Application date, September 8, 1919.

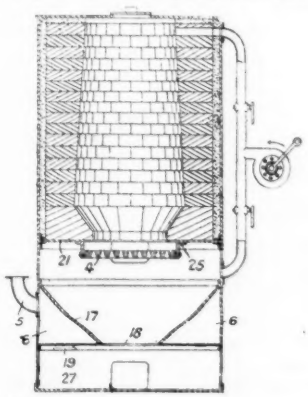
The invention comprises a new support for a catalyst which enables a higher speed of reaction to be obtained, and the resulting material may be used for such reactions as the oxidation of ammonia to nitric acid, the oxidation of sulphur dioxide to sulphur trioxide, and especially for the synthesis of ammonia. The support used consists of a mass of very fine interlacing fibres of silicon oxycarbide comprising a material known as "fibrox," described in *Transactions* of the American Electrochemical Society, Vol. XXVII. (1915), page 267, and also in Specification No. 16,299, of 1913. Finely divided nickel may be deposited on the "fibrox" by introducing the vapour of nickel carbonyl into a chamber at reduced pressure containing the "fibrox," and then heating the chamber to 180°C. to decompose the nickel carbonyl. Platinum may be similarly deposited by placing the "fibrox" in a container of refractory material, and admitting carbonyl platino-chloride (made by the action of carbon monoxide and chlorine gas on platinum sponge at about 205°C.). The catalyst may alternatively be deposited from solutions of its salts. A solution of nickel sulphate is mixed with about twice as much sodium hypophosphite as is theoretically necessary to reduce the nickel sulphate. The "fibrox" is placed in the solution, which is boiled for one hour to deposit the nickel. Platinum may be similarly deposited from a solution of chloro-platinic acid and an excess of ferrous sulphate solution, which is boiled to deposit the platinum. This catalytic material has a very large surface per unit volume which renders it particuarly suitable for use in small sized apparatus, such as that used for ammonia synthesis.

NOTE.—The following specifications which are now accepted were abstracted when they became open to inspection under the International Convention: 132,496 (Norsk Hydro-Elektrisk Kvaelstofaktieselskab), relating to phosphate manures; and 135,817 (Elektro-Osmose Akt.-Ges.) relating to dehydration by electro-osmotic treatment. (*See* THE CHEMICAL AGE, Vol. I., page 604, and Vol. II., page 159).

International Specifications Not yet Accepted

138,362. GAS PRODUCERS. L. Avellana, Figueras, Gerona, Spain. International Convention date, January 28, 1919.

A gas producer of the down-draught type is provided with a



138,362

grate 4 supported by angle-irons 25, which project downwards from a transverse plate 21 supporting the producer lining.

The producer gas may thus pass downwards between the angle-irons into the space below the grate, as well as through the grate bars. An ash deflector in the form of an inverted cone 17, with a central outlet 18 is provided below the grate, and the gases pass downwards through the cone into the ashpit 27, and then upwards into the annular space 6 surrounding the cone. Baffles are provided in this space to cause the gases to circulate before reaching the outlet 5.

138,585. MOTOR SPIRIT. Dayton Metal Products Co., Taylor Street, Dayton, Ohio, U.S.A. (Assignees of T. Midgley, 127, North Ludlow Street, Dayton, Ohio, U.S.A.). International Convention date, February 1, 1919.

A motor spirit comprising gasoline, kerosene, or other paraffin body and benzol, or other aromatic body, has its freezing point lowered by adding toluol, cyclohexane, alcohol, or naphthalene.

138,594. CHROME ALUM. G. H. Hultman, 14, Arsenalsgatan, Stockholm. International Convention date, February 6, 1919.

Ferro-chrome is ground to a fine powder and dissolved in sulphuric acid with heating and stirring, producing a solution of chromic and ferrous sulphates. It is found that the solution of the ferro-chrome is facilitated by the use of lead containing-vessels. The ferrous sulphate may, if desired, be partly crystallised out at this point, and the solution is then treated with a soluble potassium salt and the chrome alum crystallised out.

138,600. COPPER AND NICKEL, EXTRACTING. International Nickel Co., 43, Exchange Place, New York. (Assignees of R. C. Stanley, New Brighton, New York.) International Convention date, February 5, 1919.

The copper-nickel matte or other material is mixed with an alkali sulphide and smelted in a cupola furnace. The molten sulphides are run off from a fore-hearth to a separating furnace where they separate into two layers, the upper consisting of impure double sodium-copper sulphide and sodium-iron sulphide, and the lower consisting of impure nickel sulphide mixed with copper, iron, and precious metals. The upper mixture is converted to blister copper in a converter and the lower layer is drawn off and cooled. Alternatively the two layers of sulphides may be solidified, the upper layer re-smelted and then passed through a reverberatory furnace, and the lower layer re-smelted with alkali sulphide and allowed to solidify in two layers; the upper layer of these is then returned to the cupola furnace. The lower layer containing the nickel is then freed from soda and iron by leaching, roasted, and then reduced to the metal which is then cast into ingots. The ingots are refined by using them as anodes in an electrolytic cell containing pure nickel cathodes and nickel sulphate as electrolyte. The residue from the leaching may be subjected to a chloridising roast, the chloride leached out, and the residue roasted and then reduced to the metal. The copper and iron are recovered in cementing tanks and the precious metals are recovered from the electrolytic slimes.

LATEST NOTIFICATIONS.

141,025. Retorts. J. E. Kennedy. March 31, 1919.

141,028. Oil. Process of refining. K. Stiansen. March 21, 1919.

141,044. Lead and silver. Process for the recovery of, from ores and metallurgical products. Amalgamated Zinc (De Bavays), Ltd. March 29, 1919.

141,054. Rocking furnaces. J. Lambot. April 3, 1919.

141,055. Oil-fired furnaces. J. Lambot. April 3, 1919.

141,056. Rotary hearths for furnaces. J. Lambot. April 3, 1919.

141,057. Acrolein. Process for the manufacture of. C. Moureu and A. Lepape. March 31, 1919.

141,058-9. Acrolein. Condensation products of, and processes of producing the same. C. Moureu and C. Dufraisse. March 31, 1919.

141,073. Compound anode for electroplating and method of making the same. C. R. Dean. December 12, 1917.

Specifications Accepted, with Date of Application

16,530/1914. Portland Cement, Manufacture of. W. J. Mellersh-Jackson. (F. Krupp, Akt.-Ges.). July 10, 1914.

109,271. Ores, Treatment of. F. Krupp, Akt.-Ges., Grusonwerk. September 15, 1915.

115,439. Casein, Manufacture of Horny Masses from. R. Weiss. April 28, 1918.

123,738. Coal, Gasification of—and Obtaining By-products therefrom. C. H. Smith. February 16, 1918.

134,214. Sodium Sulphate, Process of Making. Salzwerk Heilbronn, Akt.-Ges. January 24, 1918.

140,112. Peat, Process for Dehydrating. C. Bouillon. January 17, 1918.

140,114. Anhydrous Metallic Chlorides, Preparation of. P. L. Hulin. May 7, 1918. Addition to 128,327.

140,115. Ethyl Alcohol and Ethyl Acetate, Process for the Synthetic Manufacture of. P. V. H. Pascal. April 3, 1917.

140,128. Petroleum Residues, Process and Apparatus for the Production of Rich Gases by Means of. Soc. de Chimie et Catalyse Industrielles. February 20, 1918.

140,266. Minerals and the like, Classifying and Concentrating Apparatus for. W. W. Richardson. May 17, 1919.

140,297. Barium Hydroxide from Barium Sulphide, Process for Preparing. E. A. Barnes. July 18, 1919.

140,331. Cyanamide, Process for Granulating. L. L. J. Barbe. March 21, 1919.

March Trade Returns

THE Board of Trade returns for March fully compensate for the set-back in our overseas trade recorded in February. The value of imports was £176,647,515, an increase on the previous month of £6,133,243; exports, £103,699,381, an increase of £17,735,251; re-exports, £27,031,357, an increase of £4,427,568. The most encouraging feature is the reduction in the adverse balance of trade from £61,946,000 to £45,916,000, the lowest figure with one exception, for several months past. Amongst the imports we notice that 10,000,000 gallons of petroleum were imported last month more than in March, 1919, the total of 63,000,000 gallons including 20,000,000 gallons of motor spirit.

The value of the chemicals, drugs, dyes and colours imported last month was £2,899,936, an increase over 1919 of £1,616,033; oil seeds, nuts, oils, &c., £7,645,167, an increase of £2,284,147; hides and skins (undressed), £3,919,839, an increase of £1,728,401; oils, fats and resins (manufactured), £6,008,531, an increase of £2,015,277; leather and manufactures thereof, £2,452,376, a decrease of £88,873.

As regards exports, we exported chemicals, drugs, dyes and colours to the value of £3,203,023, an increase of £1,196,320; oil seeds, nuts, oils, &c., £1,129,938, an increase of £946,478; hides and skins (undressed), £931,014, an increase of £850,755; oils, fats and resins (manufactured), £1,240,538, an increase of £199,581; leather and manufactures thereof, £1,420,650, an increase of £1,109,716.

Taking the quantities as distinct from values, we exported 9,263 tons of oils, fats, &c., against 2,196 tons in March, 1919; china clay, 34,779 tons, against 24,361 tons; soda compounds, 588,453 cwt., against 496,154 cwt.; dyestuffs, 26,765 cwt., against 6,433 cwt.; painters' colours, 115,900 cwt., against 118,965 cwt.; soap, 188,193 cwt., against 219,808 cwt.; candles, 20,287 cwt., against 7,106 cwt.; linoleum, 3,340,600 sq. yds., against 1,746,200 sq. yds.; cement, 41,239 tons, against 17,576 tons.

A verdict of "Accidental death" was returned at the adjourned inquiry held on Friday, April 9, into the deaths of the victims of the explosion at the PARKGATE IRON & STEEL WORKS, Rotherham, on February 17, when five workmen were seriously injured, two of whom, G. Spencer (20), blast furnace labourer, and A. Bridges (42), greaser, died later. In the course of the evidence it was stated that J. W. Bassendale, for five years a blast furnace foreman at the works, and one of the injured men, threw an old cardboard box and a piece of brown paper, in which common black gunpowder used for the purpose of "blowing" had previously been wrapped, into a grate in a cabin in which four other workmen were. Instantly an explosion occurred. In returning a verdict of accidental death, the Coroner considered that Bassendale might have been a little more careful, having regard to the dangerous properties of gunpowder, in throwing the paper into the grate. He regarded it as purely an error of judgment. Bassendale was obviously running the same risks as anyone else in the cabin, whatever they might be.

Monthly Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

British Market Report

THURSDAY, APRIL 15.

The market has been somewhat quieter in town, due, no doubt, to the tendency to extend the Easter holidays.

Values, however, remain firm, and changes are almost invariably in the upward direction. With regard to export business, this has been slightly restricted, owing to the continued depreciation in French and Italian exchange; and, on the other hand, this depreciation has not affected the value of any products in this country, as few chemicals are offering at the present time from the countries in question.

General Chemicals

ACETONE is a firm and rising market, and prices are expected to be further affected by the position in acetate of lime.

ACID ACETIC.—The recent advance in price has checked the demand slightly, but we regard this as only momentary, as still higher values are reported and American producers are mostly heavily sold.

ACID FORMIC continues in good demand, but without change in value.

ACID LACTIC is in only moderate request at last quoted figures.

ACID OXALIC is still a nominal market and small supplies are quickly absorbed.

ACID TARTARIC is firmer on the week, and it would seem that prices have not yet reached the top.

AMMONIUM SALTS are all well inquired for, but makers are mostly heavily sold.

ARSENIC is in slightly better request and price is maintained.

BARIUM SALTS are in steady demand and the price is again higher for chloride.

COPPER SULPHATE is stagnant, and sellers are inclined to make concessions.

FORMALDEHYDE is as scarce as ever, and the price is, if anything, again dearer.

IRON SULPHATE (GREEN COPPERAS) is active and the price is inclined to be firm.

LEAD SALTS are in fair demand but without changes in value.

POTASSIUM CHLORATE is dull, but price is without change.

POTASSIUM NITRATE is moving off very well at last quoted figures.

POTASSIUM PERMANGANATE is wanted, but stocks are very light.

POTASSIUM PRUSSIATE is in good request and the price has a rising tendency.

SODIUM ACETATE is in better inquiry and price is higher on the week.

SODIUM BICHROMATE.—Small second-hand parcels come on the market from time to time and demand fancy prices.

SODIUM CAUSTIC.—The export demand continues, but values do not show a further advance.

SODIUM HYPOSULPHITE is as scarce as ever, but price is without change.

SODIUM NITRITE.—The recent high values are fully maintained, and the scarcity is, if anything, even more acute.

SODIUM PHOSPHATE is in request and is inclined to be firm.

SODIUM PRUSSIATE is a shade cheaper, but with little offering.

SODIUM SULPHIDE continues in abnormal request, and prices are again distinctly higher.

STRONTIUM SALTS are slow of sale at last quoted figures.

TIN SALTS are not so active.

ZINC SALTS are moving off very well, and prices in the main show little change.

Coal Tar Intermediates

These continue in active request. One or two shipments have arrived from America, but have been quickly absorbed. All makers, both in this country and the States, are fully committed for many months ahead.

BETA NAPHTHOL is without change in price, and makers cannot accept orders unless for autumn delivery.

BETA NAPHTHYLAMINE has been asked for, but little is available.

BINITROCHLORBENZOL is wanted on export account, but licences are difficult to obtain, although good supplies are available.

DIMETHYLANILINE is in request but almost unobtainable.

NAPHTHIONIC ACID is in better demand, but prompt delivery cannot be given.

PARANITRANILINE is badly wanted and price is inclined to go still higher.

PHTHALIC ANHYDRIDE is in request at the reduced price.

SALICYLIC ACID is very active, but price is nominally without change.

Coal Tar Products

There is little change in the market since last week.

90's BENZOL.—This remains at 2s. 5d. on rails.

CRESYLIC ACID.—Supplies are still scarce. The price for Pale 97/99 per cent. quality is 4s. 3d. per gallon and for Dark 95/97, 4s.

CREOSOTE OIL remains firm at about 1s. 1½d. to 1s. 2d. in the North and 1s. 2d. to 1s. 2½d. in the South.

SOLVENT NAPHTHA is worth 3s. 3d. to 3s. 4d. per gallon.

HEAVY NAPHTHA is worth 3s. 6d. per gallon and is still difficult to obtain.

NAPHTHALENE is still scarce. Crude is worth from £14 to £18 per ton, and Refined from £34 to £38 per ton.

PITCH.—The market remains firm with few sellers, and quotations for the current season are 130s. to 135s. f.o.b. West Coast, with 140s. to 145s. f.o.b. East Coast.

Business in prompt parcels is limited to few transactions to complete deliveries at fairly full prices.

Sulphate of Ammonia

The Home trade continues to be very good, and there is no change in the position.

The rise in the American Exchange has brought about cheaper sellers in Europe of American sulphate of ammonia.

French Market Report

This market is inclined to be less active owing to the restricting influence of the Exchange. Some buyers who placed orders with this country a little time ago are endeavouring to get their deliveries postponed in the hope of the Exchange mending.

ALUM is still wanted and equal to £28 per ton has been paid.

AMMONIUM SALTS are all in immediate request.

ACETIC ACID remains in good demand; the price of glacial is about £125, and of technical about £90, both c.i.f.

ACETONE has risen greatly in value and is eagerly bought. Prices now ruling are about £115 c.i.f.

GALLIC ACID.—The supplies are meeting the demand at about 8s. 3d. per lb., c.i.f., for the technical.

ARSENIC.—Large contracts are now being placed for forward delivery, the average price is about £85 c.i.f.

LACTIC ACID 50 per cent. volume.—Normal business is being done at about £75 c.i.f.

OXALIC ACID.—Spot delivery is again being given at about 2s. 0d. per lb.

AMMONIA PHOSPHATE.—Spot lots have all been cleared at high prices, and supplies are likely to be scarce. The nominal price is £142 c.i.f.

SULPHATE OF IRON is in good demand at £12 c.i.f.

LEAD ACETATE is very quiet, but consumers are now contracting for forward delivery at about £102.

POTASH BICHROMATE.—Spot parcels are unobtainable, the nominal price is 2s. 0d. per lb.

PERMANGANATE OF POTASH.—The market is easier, and small spot supplies are offered at 2s. 3d. per lb., c.i.f.

SODIUM CAUSTIC.—Makers are much behind with deliveries and good prices are eagerly paid for spot or prompt. £51 c.i.f. is offered for the 70-72 per cent.

CITRIC ACID.—The supply is now very short, and the price about 7s. per lb.

POTASH PRUSSIATE is fairly free, and some spot supplies are offered at 2s. 3d. per lb., c.i.f.

SODIUM HYPOSULPHITE.—Makers are much averse to quoting, spot lots are very scarce, and the prices ruling are extravagant, about £31, c.i.f.

CARBONATE is asked for and the demand for CHLORIDE is also active.

PHOSPHATE is on the quiet side.

BARIUM SALTS are all very active and equal to £34 per ton has been paid for the English product. Very little is coming through from Germany.

BLEACHING POWDER is in good request, and the price is equal to about £23 per ton. Few orders, however, are being placed in England.

CALCIUM CHLORIDE is scarce and this country is unable to entertain many of the orders that are being offered. About £14 per ton is a good figure.

EPSOM SALTS are not so active, and price variable.

FORMALDEHYDE is in request, but practically unobtainable.

LEAD SALTS are inclined to drop, but there is a good demand for Litharge.

SODIUM ACETATE is firm and the price is equal to about £60 per ton.

SODIUM PRUSSIATE.—This is unobtainable, makers being very short of coal and raw materials.

SODIUM SULPHIDE is eagerly sought for, and high prices are ruling for spot or prompt, average price about £60, c.i.f.

ZINC SALTS.—The market is very steady and but little business is being transacted.

Coal Tar Intermediates

Great interest is manifested in all Coal Tar Intermediates and good prices are being obtained for the small supplies available. The colour manufacturers have been very active, and production is steadily improving.

German Market Report

In spite of internal difficulties, shortness of supplies of coal and raw materials, and unsatisfactory transport conditions, the German chemical industry is rapidly setting its house in order.

Arrangements have been come to for settling disputes amicably between employers as a whole and their employees.

Export and Import control has been practically centralised in Berlin. The representatives of manufacturers, merchants and consumers having an equal voice in the organisation; the trade is therefore practically free from Government control.

Owing to the shortage of fuel and raw materials most factories are working at about 40 per cent. of their possible production.

In spite of the exchange prices are somewhat higher than in the allied countries; for export goods especially.

Textile manufacturers are now getting supplies of raw material from abroad, and are being paid for manufacturing them; fairly active buying being the natural result.

ACETONE is in great demand, synthetic rubber manufacturers consuming important supplies. The price ruling is £115 c.i.f.

CARBOLIC ACID is very scarce.

OXALIC ACID.—More supplies are available at about 2s. 5d. per lb.

FORMALDEHYDE.—Small spot supplies are eagerly snapped up.

POTASSIUM BICHROMATE is in great request.

POTASSIUM PERMANGANATE.—Small spot parcels are being offered at about 5s. 2d. per lb.

SODIUM BICHROMATE.—Practically no supplies are available, and prompt delivery obtains fancy prices, some business being transacted at 2s. 3d. per lb.

SODIUM CAUSTIC.—The demand is greatly in excess of the supply; the nominal price is £53.

BORAX CRYSTALS are easily sold at £66.

BORACIC ACID is practically unobtainable, and extravagant prices are paid for small prompt parcels.

BICARBONATE OF SODA.—Spot lots are snapped up and prices ruling are about £21.

EPSOM SALTS.—Good quantities are being offered by makers for forward delivery at about £16, f.o.r.

LITHOPONE, 30 per cent.—Further quantities from second hand are now available at prohibitive prices; makers are oversold and not quoting.

METHYL ALCOHOL is in great demand, but no prompt deliveries can be obtained.

SODIUM PEROXIDE. Makers are now able to manufacture small quantities.

SODIUM SULPHITE.—Small supplies are being offered at high prices.

Current Prices

Chemicals

	per	£	s	d.		£	s	d.
Acetic anhydride	lb.	0	3	6	to	0	3	9
Acetone oil	ton	80	0	0	to	83	0	0
Acetone, pure	ton	115	0	0	to	120	0	0
Acid, Acetic, glacial, 99-100%	ton	115	0	0	to	120	0	0
Acetic, 80% pure	ton	92	10	0	to	95	0	0
Arsenic	ton	100	0	0	to	105	0	0
Boric, cryst.	ton	74	10	0	to	76	0	0
Carbolic, cryst. 39-40%	lb.	0	1	4	to	0	1	5
Acid, Citric	lb.	0	7	0	to	0	7	3
Formic, 80%	ton	115	0	0	to	120	0	0
Gallic, pure	lb.	0	7	3	to	0	7	9
Hydrofluoric	lb.	0	0	7	to	0	0	8
Lactic, 50 vol.	ton	65	0	0	to	70	0	0
Lactic, 60 vol.	ton	80	0	0	to	85	0	0
Nitric, 80 Tw.	ton	40	0	0	to	42	0	0
Oxalic	lb.	0	3	0	to	—		
Phosphoric, 1.5	ton	60	0	0	to	65	0	0
Pyrogallic, cryst	lb.	0	11	6	to	0	11	9
Salicylic, Technical	lb.	0	3	0	to	0	3	3
Salicylic, B.P.	lb.	0	3	9	to	0	4	0
Sulphuric, 92-93%	ton	7	15	0	to	8	5	0
Tannic, commercial	lb.	0	5	0	to	0	5	3
Tartaric	lb.	0	4	2	to	0	4	3
Alum, lump	ton	19	10	0	to	20	0	0
Alum, chrome	ton	93	0	0	to	95	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	17	10	0	to	18	10	0
Aluminium, sulphate, 17-18%	ton	20	10	0	to	21	10	0
Ammonia, anhydrous	lb.	0	1	9	to	0	2	0
Ammonia, .880	ton	32	10	0	to	37	10	0
Ammonia, .920	ton	20	0	0	to	24	0	0
Ammonia, carbonate	lb.	0	0	7½	to	—		
Ammonia, chloride	ton	95	0	0	to	97	10	0
Ammonia, muriate (galvanisers)	ton	52	0	0	to	54	0	0
Ammonia, nitrate	ton	60	0	0	to	65	0	0
Ammonia, phosphate	ton	135	0	0	to	140	0	0
Ammonia, sulphocyanide	lb.	0	2	3	to	0	2	6
Amyl, acetate	ton	360	0	0	to	370	0	0
Arsenic, white, powdered	ton	67	10	0	to	70	0	0
Barium, carbonate	ton	13	10	0	to	14	10	0
Barium, carbonate, 92-94%	ton	14	10	0	to	15	0	0
Chlorate	lb.	0	1	4	to	0	1	5
Chloride	ton	31	0	0	to	32	0	0
Barium, Nitrate	ton	50	0	0	to	51	0	0
Sulphate, blanc fixe, dry	ton	25	10	0	to	26	0	0
Sulphate, blanc fixe, pulp	ton	15	10	0	to	16	0	0
Bleaching powder, 35-37%	ton	18	10	0	to	19	10	0
Borax crystals	ton	41	0	0	to	42	10	0
Calcium acetate, Brown	ton	20	0	0	to	21	0	0
,, Grey	ton	41	10	0	to	42	10	0
Carbide	ton	30	0	0	to	32	0	0
Chloride	ton	9	10	0	to	10	10	0
Carbon bisulphide	ton	58	0	0	to	59	0	0
Casein, technical	ton	80	0	0	to	83	0	0
Cerium oxalate	lb.	0	3	9	to	0	4	0
Chromium acetate	lb.	0	1	2	to	0	1	4
Cobalt acetate	lb.	0	7	0	to	0	7	6
Oxide, black	lb.	0	7	9	to	0	8	0
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	46	0	0	to	47	0	0
Cream Tartar, 98-100%	ton	305	0	0	to	310	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol.	ton	355	0	0	to	360	0	0
Formusol (Rongalite)	lb.	0	4	0	to	0	4	3
Glauber salts	ton	5	0	0	to	5	10	0
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	50	0	0	to	52	0	0
Iron sulphate (Copperas)	ton	4	15	0	to	5	0	0
Lead acetate, white	ton	100	0	0	to	105	0	0
Carbonate (White Lead)	ton	72	0	0	to	74	10	0
Nitrate	ton	75	0	0	to	80	0	0
Litharge	ton	64	0	0	to	66	0	0
Lithophone, 30%	ton	60	0	0	to	62	0	0
Magnesium chloride	ton	15	10	0	to	16	10	0
Carbonate, light	cwt.	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	14	0	0	to	14	10	0
Sulphate (Druggists')	ton	18	10	0	to	19	10	0

	per	£	s.	d.		£	s.	d.
Methyl acetone	ton	95	0	0	to	100	0	0
Alcohol, 1% acetone	gall.	Nominal						
Nickel ammonium sulphate, single salt	ton	50	0	0	to	52	10	0
Potassium bichromate	lb.	0	2	2	to	0	2	3
Carbonate, 90%	ton	102	0	0	to	105	0	0
Chloride	ton	Nominal.						
Potassium Chlorate	lb.	0	1	1	to	0	1	2
Meta-bisulphite, 50-52%	ton	270	0	0	to	280	0	0
Nitrate, refined	ton	72	0	0	to	75	0	0
Permanganate	lb.	0	6	6	to	0	7	0
Prussiate, red	lb.	0	6	3	to	0	6	6
Prussiate, yellow	lb.	0	2	4	to	0	2	5
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt.	4	15	0	to		—	
Seconds	cwt.	4	10	0	to		—	
Sodium acetate	ton	64	0	0	to	66	0	0
Arsenate, 45%	ton	60	0	0	to	62	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Sodium, Bichromate	lb.	0	2	0	to	0	2	1
Bisulphite, 60-62%	ton	44	10	0	to	45	10	0
Chlorate	lb.	0	0	5¾	to	0	0	6¼
Caustic, 70%	ton	43	10	0	to	44	10	0
Caustic, 76%	ton	44	10	0	to	45	10	0
Hydrosulphite, powder, 85%	lb.	0	3	3	to	0	3	6
Hyposulphite, commercial	ton	28	10	0	to	29	10	0
Nitrite, 96-98%	ton	120	0	0	to	125	0	0
Phosphate, crystal	ton	40	0	0	to	42	0	0
Perborate	lb.	0	2	2	to	0	2	4
Prussiate	lb.	0	1	11	to	0	2	0
Sulphide, crystals	ton	28	0	0	to	30	0	0
Sulphide, solid, 60-62%	ton	48	0	0	to	50	0	0
Sulphite, cryst.	ton	14	10	0	to	15	10	0
Strontium, carbonate	ton	85	0	0	to	90	0	0
Nitrate	ton	85	0	0	to	90	0	0
Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	42	0	0	to	44	10	0
Sulphur, Flowers	ton	25	0	0	to	27	0	0
Roll	ton	24	0	0	to	26	0	0
Tartar emetic	lb.	0	3	5	to	0	3	6
Tin perchloride, 33%	lb.	0	2	6	to	0	2	7
Perchloride, solid	lb.	0	3	0	to	0	3	3
Protochloride (tin crystals)	lb	0	1	11	to	0	2	0
Zinc chloride, 102 Tw.	ton	22	0	0	to	23	10	0
Chloride, solid, 96-98%	ton	60	0	0	to	65	0	0
Oxide, 99%	ton	82	10	0	to	85	0	0
Oxide, 94-95%	ton	70	0	0	to	72	10	0
Dust, 90%	ton	90	0	0	to	92	10	0
Sulphate	ton	19	10	0	to	23	10	0

Coal Tar Intermediates, &c.

	per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	4	0	to	0	4	3
Alphanaphthol, refined	lb.	0	5	0	to	0	5	3
Alphanaphthylamine	lb.	0	3	6	to	0	3	9
Aniline oil, drums extra	lb.	0	1	5	to	0	1	6
Aniline salts	lb.	0	1	10	to	0	2	0
Anthracene, 85-90%	lb.		—		to		—	
Benzaldehyde (free of chlorine)	lb.	0	5	6	to	0	6	0
Benzidine, base	lb.	0	12	6	to	0	13	6
Benzidine, sulphate	lb.	0	10	0	to	0	11	0
Benzoic, acid	lb.	0	5	6	to	0	6	0
Benzoate of soda	lb.	0	5	6	to	0	6	0
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	1	6	0	to	1	7	6
Betanaphthol	lb.	0	5	0	to	0	5	3
Betanaphthylamine, technical	lb.	0	8	6	to	0	9	6
Croceine Acid, 100% basis	lb.	0	5	0	to	0	6	3
Dichlorbenzol	lb.	0	0	6	to	0	0	7
Diethylaniline	lb.	0	7	9	to	0	8	6
Dinitrobenzol	lb.	0	1	5	to	0	1	6
Dinitrochlorbenzol	lb.	0	1	5	to	0	1	6
Dinitronaphthaline	lb.	0	1	4	to	0	1	6
Dinitrotoluol	lb.	0	1	8	to	0	1	9
Dinitrophenol	lb.	0	3	6	to	0	3	9
Dimethylaniline	lb.	0	4	9	to	0	5	0
Diphenylamine	lb.	0	4	9	to	0	5	0
H-Acid	lb.	0	13	6	to	0	14	0
Metaphenylenediamine	lb.	0	5	9	to	0	6	0
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	7	6	to	0	8	6
Monosulphonic Acid (2:7)	lb.	0	7	6	to	0	8	0
Naphthionic acid, crude	lb.	0	5	6	to	0	6	0
Naphthionate of Soda	lb.	0	6	0	to	0	6	6
Naphthylamin-di-sulphonic-acid	lb.	0	5	6	to	0	6	6
Nitronaphthaline	lb.	0	1	3	to	0	1	4
Nitrotoluol	lb.	0	1	4	to	0	1	6
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	2	to	0	1	4
Orthotoluidine	lb.	0	2	6	to	0	2	9
Orthonitrotoluol	lb.	0	1	8	to	0	1	10
Para-amidophenol, base	lb.	0	15	0	to	0	16	0
Para-amidophenol, hydrochlor	lb	0	15	6	to	0	16	0
Paradichlorbenzol	lb.	0	0	6	to	0	0	8
Paranitraniline	lb.	0	8	0	to	0	8	6
Paranitrophenol	lb.	0	2	6	to	0	2	9
Paranitrotoluol	lb.	0	5	3	to	0	5	6
Paraphenylenediamine, distilled	lb.	0	13	6	to	0	14	6
Paratoluidine	lb.	0	7	6	to	0	8	6
Phthalic anhydride	lb.	0	5	6	to	0	6	0
R. Salt, 100% basis	lb.	0	4	0	to	0	4	2
Resorcin, technical	lb.	0	11	6	to	0	12	6
Resorcin, pure	lb.	0	17	6	to	1	0	0
Salol	lb.	0	5	9	to	0	6	0
Shaeffer acid, 100% basis	lb.	0	3	6	to	0	3	0
Sulphanilic acid, crude	lb.	0	1	5	to	0	1	6
Tolidine, base	lb.	0	10	6	to	0	11	6
Tolidine, mixture	lb.	0	3	0	to	0	3	6

Miscellaneous and Paint Materials

	per	£	s.	d.		£	s.	d.
Barytes	ton	11	0	0	to	13	0	0
Casein	ton	75	0	0	to	80	0	0
Chalk, precipitated (light)	ton	20	0	0	to	24	0	0
Chalk, precipitated (heavy)	ton	10	0	0	to	12	0	0
China clay (bags extra) (f.o.r. Cornwall)	ton	1	12	6	to	3	12	6
Coke, blast furnace (S. Wales)	ton	2	13	0	to	3	4	0
Coke, foundry (S. Wales)	ton	3	5	0	to	3	18	0
Fuller's Earth	ton	4	0	0	to	5	0	0
Lead, litharge flake	ton	64	10	0	to	67	10	0
Lead, red	cwt.	3	5	0	to	3	7	6
Lead, white	cwt.	3	15	0	to	3	17	6
Ultramarine	ton	90	0	0	to	110	0	0
Prussian Blue	cwt.	13	0	0	to	14	10	0
Chrome green	cwt.	6	5	0	to	6	10	0
Chrome yellow	cwt.	6	5	0	to	7	0	0
Mineral black	ton	10	10	0	to	12	0	0
Carbon black	lb.	0	1	3	to	0	1	6
Guignet's Green, 30%	lb.	0	1	7	to	0	1	9

Building Materials

	per	£	s.	d.		£	s.	d.
Bricks, stock	1000	4	14	0	to	4	15	0
Bricks, blue Staffs.	1000	9	10	0	to	9	11	0
Firebricks, Stourbridge	1000	11	8	0	to	11	12	0
Fireclay, Stourbridge	ton	2	3	0	to	2	4	6
Glass, sheet, 21 oz.	ft.	0	0	9	to	0	0	9½
Lime, ground blue Lias	ton	2	15	0	to	2	16	6
Lime, grey stone	ton	3	0	0	to	3	2	6
Linseed oil, boiled	gall.	0	11	6	to	0	11	9
Linseed oil, raw	gall.	0	11	0	to	0	11	3
Portland cement	ton	3	18	0	to	4	3	0
Slates, Bangor (First quality)	1200	40	0	0	to	41	0	0
Slates, Portmadoc (First quality)	1200	21	0	0	to	23	0	0
Tiles	1000	6	15	0	to	7	0	0
Turpentine	gall.	0	19	6	to	1	0	0
Deal, up to 3×8	standard	45	0	0	to	47	0	0
Deal, over 3×8	standard	50	0	0	to	56	0	0

The following prices are furnished by Messrs. Miles, Mole & Co., Ltd., 101, Leadenhall Street, London, E.C.

Metals and Ferro-Alloys

	per	£	s.	d.		£	s.	d.
Aluminium, 98-99%	ton	166	0	0	to	166	10	0
Antimony, English	ton	72	0	0	to	72	10	0
Copper, best selected	ton	113	0	0	to	113	10	0
Ferro Chrome, 60%	ton	45	0	0	to	45	10	0
Manganese, 76-80%	ton	35	0	0	to	35	10	0
Silicon, 45-50%	ton	23	0	0	to	23	10	0
Tungsten, 75-80%	lb.	0	3	1	to	0	3	6
Lead Ingot	ton	40	0	0	to	40	10	0
Sheets	ton	55	0	0	to	55	10	0
Nickel, 98-99%	ton	225	0	0	to	230	0	0
Tin	ton	334	0	0	to	334	10	0
Zinc Sheet	ton	84	0	0	to	84	10	0
Spelter	ton	48	0	0	to	49	0	0

Structural Steel

	per	£	s.	d.		£	s.	d.
Angles and Tees	ton	25	0	0	to	26	0	0
Flats and rounds	ton	23	0	0	to	24	0	0
Joists	ton	20	0	0	to	21	0	0
Plates	ton	24	0	0	to	25	0	0
Rails, heavy	ton	20	0	0	to	21	0	0
Sheets, 24 Gauge	ton	36	0	0	to	37	0	0
Galvd. Corrd. Sheets	ton	55	0	0	to	56	0	0

Catalogues Received

J. G. Jackson, Ltd.

Several machines for use in chemical works are described in the illustrated leaflets received from this firm. It is claimed that Type "A" Jackson Patent Vertical Filling, Weighing and Ramming Machine will accurately fill and ram powders of any class up to a pressure of 60 lb. per square inch into any shape of tin, carton, bag or bottle from a few ounces up to 10 lb. weight. In the case of thin cartons, &c., a supporting case is supplied and the resulting package is tightly packed and has a firm, regular and attractive appearance.

Type "C" Jackson Patent Horizontal Filling and Weighing Machine is a rapid continuous filling machine, which can be adjusted to fill up to 60 fills per minute, and can be fitted with a band conveyor synchronising with the rest period. It can be adjusted from 1 dram to 1 lb. and is very accurate. It does not matter what size or shape of package is required. The machine can be adjusted to fill plastic and sticky materials, which, up to the present, has been impossible in any other type of filling machine. Among the materials on which it can be used are salts, powders, various drugs, dyes, paints, cereals and soaps.—Coustonholm Works, Pollokshaws, Glasgow.

Perry & Co. (Bow), Ltd.

The value of putting its manufactures before the public in an attractive form is recognised by this firm, both in its advertisements and in its new illustrated catalogue, which is artistically printed in black and orange on art paper. Entitled "Water Gas: Its Production and Application," the catalogue gives a description and illustrations of the Perry System for the production of either blue or carburetted water-gas, together with the standard sizes of plant supplied (though the company is prepared to make to any size required), and the results obtained by gasworks using average present-day gas coke. The commercial value attached to the Perry System is indicated by illustrations of their plant in works in Bombay, Cadiz, Amsterdam, Ghent, &c.—56, Victoria Street, London, S.W.1.

Fullerton, Hodgart & Barclay, Ltd.

Realising the need for a type of pump between the heavy expensive three-throw pump of high efficiency, and the fast-running turbine or centrifugal pump with a lower efficiency, this firm have put on the market the "Fullerton" Patent Pump, a ram pump with increased revolutions. The pump requires very little more space than a centrifugal pump, and the cost is much the same. It is claimed to be very efficient on small quantities with high heads (a condition that is not met by a centrifugal pump), and is recommended for plants of small capacity. The pump is so designed that no special pump room is required.—Vulcan Works, Paisley.

The Premier Filterpress Co., Ltd.

A catalogue, of the pumps (belt, steam, shaft or motor driven), air compressors, montejus, vacuum pumps and diaphragm pumps supplied by the company, is in course of preparation, but the firm announce that they will be pleased to submit estimates to customers who furnish exact particulars of their requirements. The diaphragm pumps are so constructed that the plunger works in water and does not come into contact with the material to be pumped. All the contact parts and valves can be lined with hard lead, gun-metal, vulcanite or some other suitable alloy. Detailed information regarding the "Clenzall" Filter Cloth Washing Machine, a recent speciality of the firm for which there is now a very large demand, is given in the current catalogue of the filter presses and other manufactures of this company.—Finsbury Pavement House, London, E.C.2.

Crosby, Lockwood & Son

We have received, from Crosby, Lockwood & Son, a list of their publications in chemical technology, comprising valuable works on industrial and manufacturing chemistry, organic, inorganic and applied chemistry, leather chemistry, chemical analysis, the chemistry of petroleum, &c. Books on oils, fats and waxes, dyestuffs, rare earths, soap-making, and other branches of chemical technology are also well represented.—7, Stationers' Hall Court, E.C.4, and 5, Broadway, Westminster, S.W.1.

Brotherton & Co., Ltd.

This firm send us another booklet of their "Hydros" series. This one explains the use of Zinc Formosul (a "Hydros" derivative) in the stripping of colours from dyed fabric, and is of particular interest to the shoddy and mungo trades. Brotherton & Co. are the only British makers of "Hydros," "Formosul" and "Zinc Formosul," and if any of our readers would like a copy of this new booklet the firm will be glad to supply them.—City Chambers, Leeds.

Chemical Engineering Co. (Manchester), Ltd.

Full details of the "K.E.K." grinding mills, of which this firm are the sole makers and patentees, are given in illustrated leaflets. This machine is capable of grinding or fibring materials so diverse in character as aniline dyes and intermediate products, china clay, bauxite, limestone, chalk, mica, talc, cast-iron borings, antimony sulphide, coal, coke, charcoal, carbon, sawdust, dry colours, oxides, chemicals (including alum and borax sodas), wood pulp, old rope cuttings, rags, asbestos, &c. Its value has already been recognised by a very large number of chemical manufacturers.

Demonstrating "K.E.K." mills for grinding trials are installed in the firm's testing house. The plant is so fitted that accurate measurements of power for grinding any product can be made personally by prospective customers.—49, Deansgate, Manchester.

Improved Demand for Nitrate

ACCORDING to the circular of Thomson Aikman, jun., issued on Wednesday, April 7, the fortnight's arrivals of nitrate of soda amount to about 66,000 tons, and about 35,000 tons are due during the next fortnight. The market continues firm, with a good demand in consuming markets, and an off coast cargo was reported sold at 26s. 6d. per cwt., c.i.f., which is about the value at the close. F.o.b. has been inclined to harden and business was reported in re-sales at 15s. 8d. to 16s. 4½d. per quintal for July-December delivery, but at the close sellers are asking about 16s. 6d. There has also been some inquiry for 1921-1922 shipment at about 14s., with sellere quoting 1s. per quintal higher. All interest is now centred on ths negotiations at present going on for a large purchase from the Producers' Association for July, 1920, to March, 1921, for which offers for upwards of 1½ million tons are reported to have been made, and an early announcement is looked for.

The production in March is cabled as 205,000 tons, against 148,000 tons for the same month last year, and 253,000 tons in March, 1914. The summary of the position at March 31 is:—

	1914. Tons.		1920. Tons.
Stocks in Europe and Egypt at March 31 .	272,000	...	176,000
Afloat for Europe and Egypt at March 31.	414,000	...	190,000
Visible supply for Europe and Egypt at March 31	686,000	...	366,000
Visible supply for United States	93,000	...	251,000
Visible supply for Japan and other countries at March 31	20,000	...	70,000
Stocks in Chili at March 31	521,000	...	1,225,000
Total supply in sight at March 31	1,320,000	...	1,912,000

The Marine Department of the Board of Trade have issued a memorandum relating to the carriage of dangerous goods and EXPLOSIVES IN SHIPS. It is a pamphlet of 96 pages, and is published by H.M. Stationery Office; price 1s net. This memorandum is a reprint of the 1915 edition, with amendments, and contains, in addition, the regulations respecting the carriage of explosives. The chief amendments relate to the carriage of inflammable liquids, calcium carbide, ferro-silicon and sulphur di-oxide.

Messrs. JAMES LIVINGSTON, LTD., vacuum drying, solvent recovery and chemical plant experts, notify that on and after 30th inst. they will be located in their pre-war offices at Imperial House, Kingsway, W.C.2. Owing to the continued expansion of their business, they have taken larger offices, Rooms Nos. 420 to 425, where all communications should in future be addressed. Their telegraphic address will remain as "Cinerary, Holb. London," and their telephone No. will be Regent 789. They have also opened a branch office at 8, Rue Nouvelle, Paris (E.9), in charge of Mr. P. G. Paris, who has had a large experience in chemical plant equipment, and other Continental and Colonial branch offices will be established as early as possible.

Company News

MAYPOLE DAIRY.—A dividend has been declared of 1s. 3d. per share on deferred shares.

IDRIS HYDRAULIC TIN.—An interim dividend has been declared of 1s. per share, less tax, payable on April 28.

PARKE'S DRUG STORES.—A dividend on the preference shares for the half-year to March 31 has been declared at the rate of 6 per cent. per annum, less tax.

RENONG TIN DREDGING.—An interim dividend has been declared of 7½ per cent. (actual), against 10 per cent. in respect of the year ending June 30, less tax.

ROYAL DUTCH PETROLEUM.—It was announced on Monday that, in view of the heavy expenditure entailed in increasing its fleet and in extending its activities in other countries, the company intends this year to increase its capital by making a further issue of shares at par.

THARSIS SULPHUR & COPPER.—A dividend of 12½ per cent. has been declared (against 10 per cent.), payable, less tax, from the profit of 1919, after writing off £30,216 (against £28,949), and carrying forward £23,456 (against £29,034). The dividend for the previous year was tax free.

VAL DE TRAVERS ASPHALTE PAVING.—A further dividend has been declared of 9d. per share, less tax, making with that paid in October last 1s. per share, or 5 per cent. for the year 1919. For 1918 the dividend was 4 1-5d. per share, less tax, making 7 1-5d. per share, or 3 per cent.

BRITISH OIL & CAKE MILLS, LTD.—The directors have issued a circular to shareholders, stating that negotiations have been opened with the African & Eastern Trade Corporation, with the object of effecting a possible fusion of interests of the two companies. Discussions are in a preliminary stage, and some time must elapse before it is possible to decide whether any proposal to carry out the object in view can be laid before the shareholders.

CUMBERLAND COAL, POWER & CHEMICALS, LTD.—The company have purchased two Cumberland collieries and coking plants from the Allerdale Coal Co., Ltd., and Moresby Coal Co., Ltd., with a view to their development as auxiliaries of their projected works at Great Clifton for the manufacture of ammonia products. The company have already acquired the Oughterside Colliery and leased valuable coal royalties between Allonby and Maryport.

UNITED ALKALI.—The directors, in announcing that they are as yet unable to present last year's accounts, state that they consider the dividend of 3s. per share, already announced, fully justified. They present a combined account for the two previous years showing a profit, after transferring £30,000 to the debenture redemption fund, of £735,613, and £23,529 was brought forward. A sum of £100,000 has been allocated to general reserve, and £150,000 to special reserve, and a dividend of 3s. was paid for each year.

BARRY, OSTLERE & SHEPHERD.—At the annual meeting at Kirkcaldy on Wednesday, Mr. John Barry, chairman, stated that the company were formulating a bonus scheme, based on the annual earnings of the workers. The bonus would be dependent on the results, and would be distributed at the discretion of the board. The idea was the outcome of a friendly and fraternal spirit, and he hoped it would be received in the same spirit. The past year had been a record one in regard to turnover and profits, and it was also one in the smallness of bad debts, which amounted to only £65. He also referred to the completion of the Rosslyn works, which had been standing unfinished during the whole period of the war. The works are now in full operation.

Recent Wills

Mr. S. Williams, J.P., of Ffosyrefail House, Pontardulais, Glamorgan, one of the founders of the Pontardulais Chemical Co., Ltd. £18,982

Lancashire Development Unlimited

IN order to raise funds for the extension of Manchester University, the Governors are offering for subscription £500,000 divided into 425,000 cumulative participating ordinary bonds of £1 each and £1,500,000 cumulative participating people's bonds of 1s. 3d. each, payable as follows: On application, as much as possible; on allotment, may be spread over three years, at option of subscriber.

The Carboil Syndicate, Ltd.

THIS week the Carboil Syndicate, Ltd., are offering for sale 245,000 ordinary shares of £1 each at par, payable as follows: 2s. 6d. per share on application, 7s. 6d. per share on acceptance, 10s. per share on May 20, 1920. Payment in full may be made on acceptance, in which case interest at the rate of 7 per cent. per annum will be allowed on the amount paid in advance of due date. The purchasers will be entitled to acquire one fully-paid deferred share at the price of £1 in respect of every 50 ordinary shares purchased.

The company was formed in 1913 with the object of developing means for the production of motor spirit, oil and sulphate of ammonia from colliery waste. In the directors' report submitted to the sixth annual meeting, held on March 18, it is stated:—

"The company's activities were originally directed to the perfection of methods of oil recovery by means of low temperature carbonisation. Though the oil-recovery carbonisation plants worked with complete success the development of the industry on this basis was hampered by the fact that the oil and sulphate of ammonia were only by-products, the main product being semi-coke. The commercial success of the plant was dependent on a ready market being available for the semi-coke, a condition not always existent, particularly where, as is usually the case, the plant is needed for dealing with inferior coals, which must result in semi-coke of poor quality being produced. This circumstance greatly restricts the scope of low-temperature carbonisation as a potential source of oil, as it limits it to the treatment of the higher-grade coals, which the colliery owner can deal with profitably in many other ways, and of those scarce varieties, such as cannels, which yield an exceptionally high percentage of oils. In view of these disadvantages, the company eventually discarded all methods which depended for their main return on coke production, and concentrated its efforts upon the adaptation to oil recovery of an entirely different type of plant, known as the producer, the products of which do not include coke. The producer plant has been in general favour here and abroad, due to its successful dealing with low-grade coal and colliery waste for the production of sulphate of ammonia and power gas. Sulphate of ammonia is a product in great demand as a fertiliser, and does not present the marketing difficulties inherent in semi-coke, while the gas yielded is utilised on the spot to provide power and light to the colliery and its accessories. The drawback of the producer was, however, that it did not provide for the recovery of the oils, the larger portion of the valuable hydro-carbons contained in the coal being practically lost. The company's object has, therefore, been to remedy this defect and to devise a producer plant in which the coal, before being fed into the producer proper, passes through a zone where the oil contents are recovered by the accepted low-temperature methods.

"As the result of elaborate experiments conducted over a period of many years in this country and in America, the directors are satisfied that the company's object has been attained, and that the plant devised by the company's engineers embodies all the desiderata, as it combines the oil-producing features of low-temperature carbonisation with the recognised advantages of the ordinary producer plant, while the respective drawbacks hitherto attaching to each system are eliminated.

"To facilitate its operation, the company has made with a powerful American concern, the Vulcan Steel Products Company, Inc., a contract providing for the construction on a large scale with prompt delivery of the company's producer plants, with special arrangements for supply on credit terms to approved buyers. Prompt delivery at this time, when steel works are overwhelmed with orders for years to come, is of exceptional value, while the credit facilities will enable the company to establish its process on the profit-sharing basis which ensured the success of the by-product oven syndicates."

Of the ordinary shares 254,475 are reserved by the company for future issue, subject to an option granted to the Vulcan Trading Corporation, Ltd., to subscribe for 250,000 shares at par.

THARSIS SULPHUR AND COPPER.—A dividend of 12½ per cent. has been declared (against 10 per cent.), payable, less tax, from the profit of 1919, after writing off £30,216 (against £28,949), and carrying forward £23,450 (against £29,034). The dividend for the previous year was tax free.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Notices of Intended Dividends

BLACKWELL, RICHARD, G., 5, Hornby Road, Old Trafford, Manchester, representative of a chemical company. April 28. Trustee, J. G. Gibson, Official Receiver, Byrom Street, Manchester.

OIL PROCESSES, LTD. (CANADA), principal place of business in England, 8, Waterloo Place, London. April 24. Liquidator, H. L. Nichols, 1 Queen Victoria Street, Mansion House, E.C.4.

Liquidators' Notices

ENGLISH MARGARINE WORKS, LTD.—A general meeting of members will be held at Broadgreen, Liverpool, the registered office of the company, on Friday, May 14, 1920, at 10.45 a.m. H. Bowler, Liquidator.

LYSOL, LTD.—A meeting of creditors will be held at 9 and 10, St. Mary-at-Hill, London, E.C.3, on Friday, April 23, at 11 a.m. A. B. Russell, Liquidator.

Companies Winding Up Voluntarily

BRITANNIA GLASS WORKS, LTD.—A meeting of creditors will be held at the offices of Edmund Woodroffe, C.A., 9 and 10, Pancras Lane, Queen Street, London, E.C.4, at 3 p.m., on Monday, April 19. Creditors' claims on or before this date to E. Woodroffe, or T. Scott, joint Liquidators, at the above address.

TRINIDAD MONTSERRAT PETROLEUM CO., LTD.—(Winding up voluntarily for amalgamation purposes). A meeting of creditors will be held at 15, Angel Court, Throgmorton Street, E.C.2, on Monday, April 26, at 3 p.m. Creditors' claims on or before May 14 to L. V. C. Briggs, Liquidator, at the above adress.

TRINIDAD WESTERN CENTRAL PETROLEUM CO., LTD.—(Winding up voluntarily for amalgamation purposes). A meeting of creditors will be held at 15, Angel Court, Throgmorton Street, E.C.2, on Monday, April 26, at 3 p.m. Creditors' claims on or before May 14 to L. V. C. Briggs, Liquidator, at the above address.

TURNER BROTHERS ASBESTOS CO., LTD.—(Winding up voluntarily for reconstruction purposes). Liquidator, Mr. H. S. Howorth, of Overdale, 245, Edenfield Road, Rochdale.

WASHINGTON CHEMICAL CO., LTD.—(Winding up voluntarily for reconstruction purposes). A meeting of creditors was appointed to be held at the offices of Newalls Insulation Co., Ltd., 31, Mosley Street, Newcastle-on-Tyne, on Wednesday, April 14. F. S. Newall, Liquidator.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, created after July 1, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.*]

ALUMINIUM CORPORATION, LTD., LONDON, E.C.—Registered March 22 (by order on terms), transfer of mortgage securing £4,528, to Col. H. Mostyn, Bodysgallen, nr. Llandudno, and another; charged on land and hereditaments at Llanbedi-y-Cenin. *£324,575. July 14, 1919.

BRITISH VEGETABLE PRODUCTS, LTD., PORTSMOUTH.—Registered March 22, £3,000 debenture, to D. R. Syndicate, Ltd., High Street Chambers, Coventry; general charge. *——. February 19, 1919.

NEUCHATEL ASPHALTE CO., LTD., LONDON, S.W.—Registered March 22 (by order on terms), 20,000 frs. charge, to Banque Cantonale Neuchateloise, Neuchatel; charged on house and land at Travers, Switzerland. *£4,600. August 14, 1919.

Satisfaction

SAPON SOAPS, LTD., LONDON, E.C.—Satisfaction registered March 30, for £5,000, balance of £20,000, registered January 5, 1920.

Bill of Sale

[*The undermentioned information is from the Official Registry. It includes Bills of Sale registered under the Act of 1882 and under the Act of 1878. Both kinds require re-registration every five years. Up to the date the information was obtained it was registered as given below; but payment may have been made in some of the cases, although no notice had been entered on the Register.*]

TAYLOR, JAMES EDWIN, 29, Hale Gardens, West Acton, chemical broker and general merchant. Filed April 12, £100.

County Court Judgment

NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

NOBLES DRUG STORES, LTD., 2, Well Street, Cable Street, E., chemists. £11. 14s. 6d. March 2.

New Companies Registered

The following list has been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C.:—

AGWI PETROLEUM CORPORATION, LTD., 58, Victoria Street, Westminster, S.W.—Producers of oils and petroleum. Nominal Capital, £1,000,000 in 1,000,000 shares of £1 each. Minimum subscription, 7 shares. Directors: Sir J. Davies, 29, Chester Terrace, N.W.; D. Davies, Broneivion, Llandinam, Montgomery; N. Dunn, 85, Gracechurch Street, E.C.; D. P. Barnett, Baltic House, Cardiff; H. Davies, Merthyr House, Cardiff. Qualification of Directors, £1,000. Remuneration of Directors, £500 each. Chairman, £1,000.

BOLTON WELDING CO., LTD., 42, Howard Street, Bolton.—Cast iron, aluminium welding and oxy-acetylene welding, &c. Nominal capital, £1,500 in 1,500 shares of £1 each. Directors, W. Challender (managing director), H. Burrows, R. Tonge, T. Y. Ritson. Qualification of directors, 50 shares. Managing director, £312.

CALLIM METALLURGICAL CO., LTD., 92, Banner Street, E.C.—Nominal capital, £10,500 in 10,000 cumulative preference shares of £1 and 500 ordinary shares of £1 each. Directors, to be appointed by subscribers. Qualification of directors, one share.

COWEN, FOLLETT & JONES, LTD., 24, Lawrence Lane, Cheapside, E.C.—Soap manufacturers. Nominal capital, £2,000 in 20,000 founders' shares of 2s. each. Directors, C. G. Cowen, "Silverdale," 136, Turney Road, Dulwich, S.E.; P. J. Follett, 11, Hillier Road, S.W.; C. F. Jones, 90, Withington Road, Bowes Park, N. Qualification of directors, 1,000 shares.

FOODS & FERTILIZERS, LTD., Pelham Chambers, Old Market Place, Grimsby.—Nominal capital, £2,000 in 2,000 ordinary shares of £1 each. Directors, to be appointed by subscribers. Qualification of directors, one share.

HICKS, MILLS, ELSWORTHY & CO., LTD.—Manufacturers of drugs, chemicals, oil and perfumery, &c. Nominal capital, £3,000 in 2,800 10 per cent. cumulative preference shares of £1 each and 800 ordinary shares of 5s. each. Directors: A. F. M. Hicks, 235, Queen's Road, Wimbledon, S.W.; A. Mills, 44, Hollydale Road, Peckham, S.E.; G. Hicks, 235, Queen's Road, Wimbledon, S.W.; Ada Elsworthy, 115, Haydon's Road, Wimbledon, S.W. Qualification of directors, one share.

LONDON FINE CHEMICALS, LTD., 53, Doughty Street, W.C., chemists, druggists and drysalters.—Nominal capital, £6,000 in 3,000 preference shares of £1 and 20,000 ordinary shares of 1s. each. Directors, to be appointed by subscribers. Qualification of directors, one share.

LONDON & MIDLAND OIL CO., LTD., 65, London Wall, E.C.3.—To purchase petroleum and other oil-bearing lands and turn same to account. Nominal capital, £250,000 in 250,000 shares of £1 each. Minimum subscription, seven shares. Directors, W. Maclachlan, 65, London Wall, E.C.; F. H. Hamilton, 10-11, Austin Friars, E.C.; A. J. Cope, 33, Waterloo Street, Birmingham. Qualification of directors, 250 shares (other than first directors). Remuneration of directors, £300 each; chairman, £400.

LUDGATE CHEMICAL MANUFACTURING CO., LTD., 5, Wine Office Court, Fleet Street, E.C.4.—Manufacturing pharmaceutical chemists, chemists and druggists sundriesmen. Nominal capital, £500 in 500 shares of £1 each. Directors, L. W. Soar, 23, Romola Road, Herne Hill, S.E.; H. M. Soar, 23, Romola Road, Herne Hill, S.E. Qualification of directors, one share.

PENTNEY SYNDICATE, LTD., 67, High Street, King's Lynn, Norfolk.—To acquire, prospect and work oilfields and oil and gas bearing properties of all kinds. Nominal Capital, £100,000 in 100,000 shares of £1 each. Directors: A. G. Hawkins, Little Congham, King's Lynn, Norfolk; F. W. Ruston, Noden House, Chalteres, Cambs.; T. Dorrington, The Chestnuts, Wistow, Hunts; Captain J. D. C. Hawkins, 22, St. John's Park, Blackheath, S.E. Qualification of Directors, £500. Remuneration of Directors, £100 each.

Benn Brothers Journals

Some Features of the Current Issues

AERONAUTICS.

"The Inter-Allied Commission: Disquieting Information from Germany" (special); "Elementary Principles of Aeroplane Design," by Col. J. Morris; Character Sketch of Major General Sir F. H. Sykes ("Pioneers of Aviation" series).

THE CABINET MAKER.

"Small Folding Tables"; "Woodwork at the Building Trades' Exhibition."

THE ELECTRICIAN.

"Wiring for Electric Light," by Alan Kirk; "Electrical Equipment of Artisan Dwellings," by James Cleary; descriptive article on "Electrically Driven Conveying Machinery," for use in coal yards, gold mines, &c.

THE FRUIT-GROWER.

"Forcing Roses"; "Notes on Some Fungous Diseases," by E. S. Salmon; "Wages and Hours of Agriculture."

THE GAS WORLD.

"Allocation of Manufacturing Costs and Costing of Work"; "Performance and Management of Gas Engines"; "Benzol as a Motor Fuel."

THE HARDWARE TRADE JOURNAL.

"Labour Saving in the Foundry" (No. 8), by Joseph Horner; "France as an Iron and Steel Producer"; and "American Competition in the Hardware Trade."

WAYS AND MEANS.

"The State of Exchange and Foreign Opinion," by the Editor; "Housing in Yorkshire," by W. R. Bayes; and "Some Sociological Aspects of the Present Industrial Position," by Professor Urwick.

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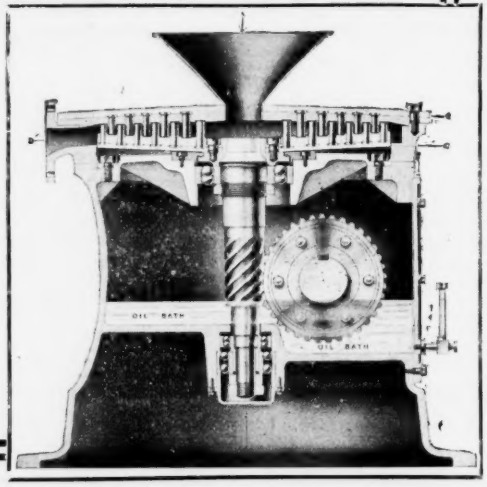

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